

Document

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**A semantic model for
describing perceived
environment**

Rikard Küller

1972

**National Swedish
Building Research**



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landskapsbilder och dels på arbetsmiljö i full skala. Faktorstrukturerna visade sig även i dessa fall vara tillämpliga. Vid bedömning av landskapsbilder framkom faktorerna trivsamhet, komplexitet, helhet och rumslighet. Vid bedömning av arbetsmiljöer framkom trivsamhet, helhet, rumslighet, social status och komplexitet.

Slutligen utförde vi ett försök enligt design 1, där såväl försökspersoner som miljöer hade mera heterogen sammansättning. Av de tidigare använda svarsvariablerna behölls 33 stycken och ytterligare 33 nya lades till. Bearbetningen resulterade i åtta faktorer, vilka kunde ges samma tolkning som de ursprungligen erhållna. Vi drog därför slutsatsen att den semantiska miljöbedömningen med fördel kan beskrivas i åtta huvuddimensioner.

I en serie försök studerades hur försöksgruppernas sammansättning inverkar på bedömningar gjorda i de olika dimensionerna. Jämförelser gjordes mellan arkitekter, gymnasister, husmödrar, studerande av arkitektur, inredningsarkitektur och landskapsarkitektur samt en försöksgrupp av allmänt representativ karaktär. Erfarna arkitekter tycktes avvika ganska mycket från övriga grupper i bedömning av trivsamhet. Det föreföll också troligt att själva försökssituationen delvis inverkar på bedömningarna. Om en och samma försöksperson fick bedöma flera miljöer blev skillnaderna större än om varje miljö bedömdes av olika individer.

De olika dimensionernas giltighet kunde i viss utsträckning kontrolleras genom att den semantiska mätmetoden använts parallellt med andra metoder. Komplexitet visades bero dels av det antal enheter som fanns i miljön, dels också av färgstyrka. Helhet kunde definieras som frånvaro av störande enheter av varaktig karaktär. Rumslighet uppvisade ett negativt samband med ljusheten hos ett rums begränsningsytor. Kraftfullhet och social status visade också vissa samband med färgsättning.

Tolkning av faktorerna

Utifrån de samlade resultaten tolkades dimensionerna på följande sätt:

Trivsamhet faller i regel ut som första faktor. Dimensionen kan ses som ett mått på den grad av trivsel och trygghet som individen upplever inför miljön. Det är ingen tvekan om att den motsvarar Osgoods m fl *evaluation-factor*, vilken härmed har visat sig återkomma även vid miljöbedömning. (Exempel på positiva och negativa skattningsskalor: BRA, IDYLLISK, STIMULERANDE, TRIVSAM, TRYGG, BRUTAL, FUL, TRÅKIG.)

Komplexitet kan anses utgöra ett mått på miljöns livlighet och komplexitet. Den tycks i stort sett motsvara Osgoods m fl *activity-factor*. (Ex: BROKIG, LIVLIG, SAMMANSATT, DÅM-

PAD.)

Helhet har tolkats som ett mått på hur väl olika delar i miljön passar ihop, eller hur väl de fungerar tillsammans. (Ex: FUNKTIONELL, HELHETSBETONAD, KONSEKVENT, STILREN.)

Rumslighet tycks beskriva inneslutenhet respektive rymd och ljushet hos en interiör, ett gaturums slutenhet respektive utsträckning eller en byggnadsgrupps avgränsning respektive utspriddhet. (Ex: AVGRÄNSAD, SLUTEN, LUFTIG, ÖPPEN.)

Kraftfullhet beskriver graden av inneslutenhet, potentiell kraft i miljön. Den innebär dessutom att en miljö ofta associeras till det ena eller andra könet. Den motsvarar Osgoods m fl *potency-factor*. (Ex: KRAFTFULL, MASKULIN, FEMININ, ÖMTÅLIG.)

Social status kan sägas utgöra en ekonomisk och social värdeområde. (Ex: DYRBAR, PÅKOSTAD, VÄLVÅRDAD, ENKEL.)

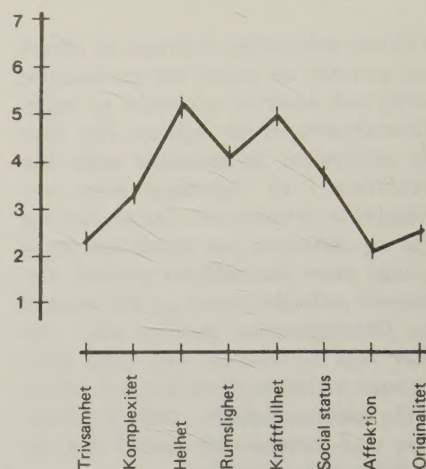
Affektion tycks beskriva en åldersaspekt hos miljön men också en känsla för det gamla och genuina. (Ex: TIDLÖS, ÅLDERDOMLIG, MODERN, NY.)

Originalitet slutligen, är ett mått på det ovanliga eller överraskande i en miljö. Det man inte tidigare sett får högt värde i denna dimension. Den motsvarar eventuellt Osgoods m fl *novelty-factor*. (Ex: EGENDOMLIG, SPECIELL, ÖVERRASKANDE, VANLIG.)

Slutsatser

De åtta huvuddimensioner som erhållits är rent allmänt oberoende av varandra. Trivsamhet, komplexitet, helhet, rumslighet m fl är mått på olika aspekter och kan variera oberoende av varandra. Det förefaller troligt att det för varje bestämd miljö finns neutrala zoner i de olika dimensionerna, vilka bestäms utifrån individens förväntningar. En festlokal och ett sjukrum förväntas ha olika komplexitet osv. Det är möjligt att olika miljöer måste kunna tillskrivas olika optimala sammansättningar av egenskaper för att människor där skall finna sig tillrätta och uppleva trygghet. Ett sådant resonemang bör kunna provas experimentellt och kan eventuellt resultera i en teoretisk modell.

Det är också sannolikt att individens personlighet är avgörande för hur han upplever och bedömer sin omgivning. Genom att testa en grupp hushållslärare med ett personlighetsformulär kunde de delas in i dels utåtriktade — inåtvända, dels stabila — neurotiska. Därefter fick de bedöma hur de trodde att de skulle bli påverkade av olika slags miljöer. De trodde sig genomgående bli mer utåtriktade i miljöer som var trivsamma än i miljöer som var otrivsamma. De trodde också att de skulle bli mer stabila i miljöer med hög trivsamhet. De mera stabila individerna trodde sig dessutom påverkas gynnsamt i miljöer med låg komplexitet.



Kurvan visar hur bostadsområdet på bilden bedömts av en försöksgrupp bestående av 56 slumpmässigt utvalda personer.

De mest tillförlitliga av de tidigare använda skattningsskalorna har sammanställts till ett test där trivsamhet mäts med åtta olika skalor samt de övriga dimensionerna med vardera fyra skalor. För att pröva hur tillförlitligt testet var fick en grupp teknologer vid två tillfällen med en veckas mellanrum bedöma en föreläsningssal. Stabiliteten för de åtta olika faktorerna var tillfredsställande och sambandet mellan faktorer lågt.

Det samlade materialet visar att den semantiska beskrivningsmodellen är meningsfull för gestaltad miljö och att de olika dimensionerna härvid har hög giltighet och är mätbara med ett standardiserat förfarande.

Fortsatt forskning

Den fortsatta forskningen bör läggas upp enligt tre linjer. För det första skall mätmetoden samordnas med lämplig presentationsmetodik. Detta kommer att möjliggöra en noggrannare bedömning av miljö redan på planeringsstadiet. En andra forskningslinje innebär studium av en bestämd miljötyp, exempelvis verkstadsindustri, för att se om det är möjligt att fastställa en optimal sammansättning av egenskaper för sådan miljö. Slutligen måste de olika dimensionerna studeras var för sig och kontrolleras med andra metoder. Detta kommer förhoppningsvis att leda till en fördjupad förståelse för samspelet mellan människan och hennes miljö.

A semantic model for describing perceived environment

Rikard Küller

This thesis reports on an attempt to develop a method for systematically measuring and describing perception of human environment. The basic hypothesis was as follows: The total perception of man-made environment can be described in a limited number of meaningful dimensions. These can in themselves be defined and measured and they are valid within determinable limits. The hypothesis was tested by letting groups of experimental subjects rate various environments with descriptive words, which were given the form of rating scales, i.e. semantic rating scales. Data was processed by means of factor analysis, through which eight main dimensions were obtained.

Earlier experiments

Osgood, Suci and Tannenbaum had shown that it was possible to obtain a relatively simple semantic description model by using factor analysis. These researchers were mainly employed in measuring the semantic meaning in different concepts, but also presented studies within the field of aesthetics. They obtained three meaningful main dimensions with great validity as well as a further four dimensions which seemed to be more difficult to interpret. They did, however, have difficulties when trying to measure the dimensions in a uniform way for different research areas. By limiting the area of measurement to perception of man-made environment we hoped to obtain dimensions which would be easier to interpret and more meaningful when attempting to evaluate an environment, and could also be measured through a standardized approach.

Method

Like Osgood et al, we used seven-level semantic scales, but instead of letting these be defined by opposed pairs only one descriptive word was, as a rule, used for each scale.

The type of scale used by Osgood et al:

BAD : - : - : - : - : - : - : - : - : GOOD

Type of scale used in this study:

GOOD

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

The experiments were conducted and processed in two ways, different from one another in principle. According to the first alternative, a group of persons were to evaluate a number of environments with several different scales. For each environment a calculation of group

mean values was made, which formed the basis of correlation calculations and factor analysis. This manner of approach results in factors or dimensions which can be said to describe average differences between environments. As a rule, these environments were presented in the form of colour slides and the processing was termed design 1.

According to the second alternative, an experiment group was to evaluate only one environment, in this case also with many different rating scales. Thus, the individual ratings formed the basis for correlation calculations and factor analysis. The factors or dimensions obtained according to this procedure can be said to describe individual variations in an evaluation of that very environment. The alternative was applied when evaluating full-scale environments and was termed design 2.

Factors obtained

In the first experiment a group of high-school students evaluated colour slides of 15 interiors in 78 different rating scales. The descriptive words constituted a representative selection from the *Glossary of the Royal Swedish Academy*. The processing of data from this experiment, which was conducted according to design 1, resulted in eight factors which could be given a meaningful interpretation. They were:

Pleasantness
Social status
Enclosedness
Originality
Complexity
Affection
Unity
Potency

In the next experiment a group of technology students evaluated an interior in the same 78 variables. In this procedure, according to design 2, three factors were obtained, which could be interpreted as pleasantness, complexity and enclosedness. This was seen as a confirmation of at least some of the factors obtained earlier, being valid even for full-scale interiors.

In a third experiment a group of high-school students evaluated a housing development, and data was processed according to design 2. The response variables were largely the same as earlier. In this case four factors were obtained, which could be interpreted as pleasantness, originality, complexity and enclosedness. The earlier obtained factors could now be considered partly valid for evaluating full-scale exteriors as well.

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Our results received so far were followed up in a couple of studies, partly on landscape pictures and partly on full-scale working environment.

The above factor structures proved to be applicable even in these cases. When evaluating landscape pictures the factors pleasantness, complexity, unity and enclosedness were obtained. When evaluating working environments pleasantness, unity, enclosedness, social status and complexity were obtained.

We finally conducted an experiment according to design 1, where subjects as well as environments had a more heterogeneous composition. Of the response variables used earlier, 33 were retained and a further 33 were added. The processing resulted in eight factors which could be given the same interpretations as those originally obtained. We therefore came to the conclusion that semantic ratings of environment can, with advantage, be described in the above eight main dimensions.

In a series of experiments we studied the effect of the composition of the experimental groups on evaluations made in the various dimensions. Comparisons were made between architects, high-school students, housewives, students of architecture, interior design and landscape architecture as well as an experimental group of a generally representative character. Experienced architects seem to deviate to a great extent from other groups as far as pleasantness is concerned. It also seemed probable that the experimental situation in itself partly influenced the evaluations. If one and the same subject was to evaluate several environments the difference would be greater than if each environment was evaluated by different individuals.

The validity of the various dimensions could, to a certain extent, be controlled by using the semantic rating method simultaneously with other methods. Complexity was shown to depend partly on the number of units present in the environment, partly also on chromatic strength. Unity could be defined as absence of disturbing units of a permanent character. Enclosedness showed a negative correlation with the lightness in the limitation surfaces of a room. Potency and social status also showed certain correlations with colouring.

Interpretation of the factors

From the collected results, the dimensions were interpreted in the following way:

Pleasantness does, as a rule, come out as the first factor. The dimension can be seen as a measure of the degree of pleasantness and security which the individual experiences in the environment. There is no doubt that this corresponds to Osgood's et al *evaluation-factor*, which has thus proved to come out even when evaluating environment. (Examples of positive and negative rating scales: GOOD, IDYLIC, STIMULATING, PLEASANT, SECURE, BRUTAL, UGLY, BORING.)

Complexity can be said to constitute a measure of the liveliness and complexity of the environment. It seems, largely, to

correspond to Osgood's et al *activity-factor*. (E.g. MOTLEY, LIVELY, COMPOSITE, SUBDUED.)

Unity has been interpreted as a measure of how well various components in the environment fit together, or how well they function together. (E.g. FUNCTIONAL, WHOLE, CONSISTENT, OF PURE STYLE.)

Enclosedness seems to describe space and lightness in an interior, the closedness and extent, respectively, of a street or the demarcation and dispersal of a group of buildings. (E.g. DEMARCAT-ED, CLOSED, AIRY, OPEN.)

Potency describes the degree of intrinsic, potential force in the environment. It also implies that an environment is often associated with one sex or the other. It corresponds to Osgood's et al *potency-factor*. (E.g. POTENT, MASCULINE, FEMININE, FRAGILE.)

Social status can be said to constitute an economic and social evaluator. (E.g. EXPENSIVE, LAVISH, WELL-KEPT, SIMPLE.)

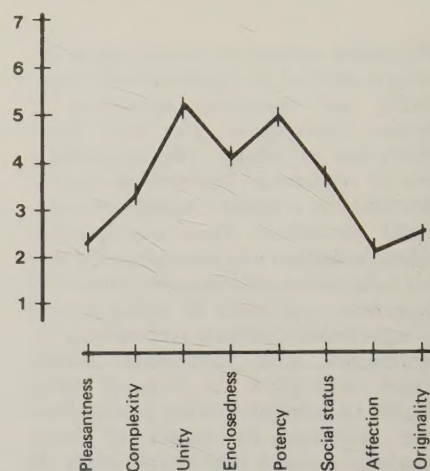
Affection seems to describe an age aspect in the environment, but also a feeling for the old and genuine. (E.g. TIMELESS, AGED, MODERN, NEW.)

Originality, finally, is a measure of the unusual or surprising in an environment. The so far unseen is given high value in this dimension. It may correspond to Osgood's et al *novelty-factor*. (E.g. CURIOUS, SPECIAL, SURPRISING, ORDINARY.)

Conclusions

The eight main dimensions obtained are quite generally independent of each other. Pleasantness, complexity, unity, enclosedness etc. are measures of different aspects and may vary independent of each other. It seems probable that there are neutral zones in the various dimensions, for each definite environment, which have been determined from the expectations of the individual. A restaurant and a sickroom are expected to have different complexities etc. It is possible that different environments must be ascribed different optimal compositions of qualities in order for the persons there to be at ease and experience security. It should be possible to test such a reasoning experimentally and this may result in a theoretical model.

It is also probable that the personality of the individual is decisive to the way he perceives and rates his environment. By testing a group of domestic-economy teachers with a personality questionnaire they could be divided into, on the one hand, extrovert — introvert, and on the other hand stable — neurotic. They then evaluated the way in which they believed that various environments could influence them. They did, throughout, believe that they would become more extrovert in environments which were pleasant, than in environments which were unpleasant. They also believed that they would become more stable in environments of high pleasantness. The more stable individuals further believed they would be favourably affected in environments of low complexity.



The graph shows how the housing development on the picture was evaluated by an experimental group consisting of 56 randomly selected persons.

The most reliable of the rating scales used have been compiled in a test where pleasantness is measured with eight different scales and the remaining dimensions with four scales each. In order to try out the reliability of the test we let a group of technology students evaluate a lecture hall on two occasions one week apart. The stability for the eight different factors was satisfactory and the correlation between the factors was low.

The collected material shows that the semantic description model is meaningful for a man-made environment and that the different dimensions are of high generality and are measurable by a standardized approach.

Future research

The future research should be projected along three lines. First, the rating method is to be co-ordinated with a suitable method of presentation. This will make possible a more careful evaluation of environment already at the projection stage. A second line of research implies the study of a definite type of environment, e.g. manufacturing industry, in order to see whether it is possible to determine an optimal composition of qualities for such an environment. Finally, the different dimensions must be studied separately and be controlled with other methods. Hopefully, this will lead to a deeper understanding of the interplay between man and his environment.

A SEMANTIC MODEL FOR DESCRIBING
PERCEIVED ENVIRONMENT

by Rikard Küller

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This thesis comes under a fairly new field of research, namely that of architectural psychology, in which there is, today, great international interest. This has recently been demonstrated in different ways, among other things through the inclusion of architectural psychology at various conferences in ergonomics, in applied psychology and architecture. The clearest expressions so far are perhaps the Architectural Psychology Conference, which took place at the Kingston Polytechnic in September, 1970 and the scientific journal *Environment and Behaviour*, published since 1969. In Sweden, Carl-Axel Acking, Lennart Holm and Anders Hård took the initiative for a conference in Lund in 1967, on this subject, which was then followed by the establishing of a collaboration group with symposiums in Lund, Stockholm and most recently in Gothenburg. The Swedish Council for Building Research has, during the last few years, supported a number of research groups within this field.

Since 1965 I have been working at the Department of Theoretical and Applied Aesthetics, at the Section of Architecture, the Lund Institute of Technology. The research work to be presented here is part of project Bs 320 Dynamic Visual Architectural Perception, for which Professor Acking has received grants from the Swedish Council for Building Research. The work, which was begun in 1966, has been continuously followed by Professor Gudmund Smith at the Department of Psychology in Lund, where I obtained my basic training as a researcher. I want to thank Carl-Axel Acking and Gudmund Smith for their warm support and competent advice.

It is evident that during many years of work one meets and collaborates with a number of people whose part in the final product will never be established. The colleagues in the research group at my department have their share of the responsibility. Not only because they have listened to ideas and provided impulses but also because they have readily acted as experimental leaders and co-judges at an infinite number of occasions. Their names are Gunvor Andersson, Marianne Arlock, Ulf Bunke and Gunnar Jarle Sorte. During the course of work a number of technical and artistic problems have arisen. Eva Acking, Rudolf Birke and Karl-Erik Jonasson have helped to solve some of these. There are others I wish to thank, persons who have helped to write computer programs, controlled a statistical design or assisted in laboratory arrangements. Professor Carin Boalt at the Lund Institute of Technology and the research secretaries Camilla Asklund and Ingrid Lundahl at the Swedish Council for Building Research have considerably facilitated certain parts of the work through their positive and factual standpoint. Finally I wish to thank all the patient subjects who have been a condition for conducting the experiments and my wife, Maud, for helping out when there was little time but much to do.

I hope that architectural psychology will prove to be a fruitful and important basis when planning a better human environment, and that this thesis will find its place in the connection. Here the reader must be clear on one point; that while the publication is in English, all experiments have been carried

out in Swedish, under Swedish circumstances and in the Swedish language. The general results are probably valid for English circumstances as well. This can, among other things, be considered the case for the appearance and content of the eight main dimensions and for the discussion of general theory as well as personality. The individual semantic variables, i.e. the words, have, on the other hand been translated from Swedish directly into English. Although the translated version of the test in a preliminary study showed very high agreement with the Swedish Standard version, no English standardization has yet been conducted. This implies that the test should not unconditionally be used under English circumstances. In order to provide the Swedish reader with an exact notion of the content of the variables, these, as well as the test are presented in both Swedish and English in the appendix.

Bosarp, Svedala, August 29th, 1972

Rikard Küller

FOREWORD BY PROFESSOR CARL-AXEL ACKING

This thesis deals with an attempt at developing a method for systematically describing and measuring the way in which an individual or a group of people perceive an environment presented to them or in which they reside. It may be a room, a housing development, a working place, part of a town or perhaps a piece of countryside.

It is evident that the individual's perception of his environment is significant to his total relation to the same. In a study of this relationship one is faced with problems of theoretical as well as practical nature. Already when investigating earlier research results, above all within the fields of architectural theory and psychology, the difficulties begin.

The traditional attitude of the architect as designer of mainly handicraft environments, has meant that subjective design has dominated. Systematic documentation has, when present, had a mainly practical-functional, technical or economic basis. The creative, psychological or artistic results - the building and those sketches and drawings which the architect leaves behind - have often been the only traces of perhaps an entire life of architectural philosophizing.

The literature on architectural theory at hand is often related to monumental works only and spread over so many fields that it is difficult to compile. Furthermore, and this is fairly decisive, different writers on architectural theory use different terminology, which very often refers to individual experiences and thoughts with slight possibilities for intersubjective understanding.

Within the field of experimental psychology one has, on the other hand, preferred to work with extremely limited aspects of the environmental situation. It is therefore often impossible to apply such results directly within the field of architectural design.

Environments have always been the work of people with insight and creative imagination. Such environments have constituted a framework for human life which has been in concordance with its content. Older environments often have this character, wherefore a study of these environments with present-day research methods would probably be fruitful. Here, it has, however, been considered more urgent to study design of environment in our own time.

The design process is far more complicated in modern society than it was earlier. This depends partly on the fact that the objects are, as a rule, larger and demand a higher degree of specialization within the project group. This, paired with shortage of time gives the co-ordinating architect little opportunity for clarifying or visualizing how a planned environment will be perceived by the people who will live and work there.

But even if the architect had the power to express his views on the aesthetic value of the project the decision-makers would probably show little consideration to this matter in relation to other, more measurable qualities. Subjective views of a generally descriptive nature often have difficulties in standing up to economic and technical facts. The present age demands a scientifically based presentation for views, no matter how sound they may be, to be heard. The above will be reason enough to motivate the work presented here.

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1 PROBLEM AND METHOD

1:1 INTRODUCTION

As one is faced with the task of attempting to measure perception of human environment a number of different queries arise. One must first of all attempt to define the problem area and find suitable methods for measuring. Furthermore, data must be systematically collected and be processed and described in such a way as to arrive at a meaningful interpretation. These queries will be dealt with in the first section of this report.

The next section is experimental and encompasses a general test of the method of approach chosen. Method and description models are thus applied to various types of environments and experimental groups.

Some special aspects of a theoretical nature are studied in the third section, among other things questions concerning the stability and validity of the method. In this section an elaboration on personality is also presented.

The last part consists of a summary of results and method. The development of a test is also presented here, as well as a discussion of future possibilities of research.

We will now, in a very general way, attempt to describe the situation to be measured, or, to use a more correct expression, the situation which the measuring constitutes: A few persons find themselves in an environment, e.g. a newly built housing development. We want to know how they perceive it. Several different methods may be useful, e.g. behavioural observation, psychophysics, interviews or semantic ratings. We have worked mainly with the latter, since it admits a well-structured, but at the same time, a nuanced communication with the experimental subjects throughout. This is important when studying perception. Other methods have been used as supplements. (See e.g. Küller, 1971.)

The basic hypothesis in this work can briefly be described in the following way: The total perception of environment may be described in a limited number of meaningful dimensions. These can be separately defined and measured and they are valid within determinable limits. Thus, the aim has been to attempt to describe the perception of an environment presented in a limited number of generally valid dimensions. The work has, in short, been made in such a way that groups of experimental subjects have judged various environments with the aid of a large amount of descriptive words. In the following process, which entailed factor analysis, we have received a grouping in factors, of the words, which have been considered to reflect various aspects of the environmental perception. Words, which at the time of judgement show a general co-variation come out in the same factor, whereby the various factors received are to be seen as

main dimensions for describing environment, independent of each other. Through repeated tests with different test groups, environments and descriptive words, it has been possible to study the generality of the dimensions. The factor analytical method used, does, among other things, entail the grouping of the descriptive words in factors entirely governed by the judgements of the subjects.

We will, in the presentation, use the following terms, which should therefore be explained. Environmental perception: The mental process with perceptual and cognitive components which relate the ego to the surroundings. In our case these are as a rule man-made. Environmental judgement: Those parts of this perception made conscious by instruction and passed on in the judgement process. Semantic variable: Descriptive word in the form of a rating scale. Dimension: An imaginary axis along which a number of variables co-vary. The variable group is termed "factor". "Dimension" stresses a measurement aspect, while, instead, "factor" stresses an interpretation aspect. Sometimes, however, "dimension" and "factor" will be used synonymously.

1:2 PROBLEM

We will now return to those hypothetical persons who found themselves in a new housing development. We wish to know how they perceive the area and therefore we approach one of them saying "Would you, please, describe your perception of this development?" He looks around. Just before we asked he had probably not given it any closer thought. "It is rather boring", he says. What, then, does this answer give us? What does this person mean by the word "boring"? Does he mean the same thing we do when we find something boring? The feeling of what "boring" stands for is intuitive and beyond scientific measuring. This problem can, however, be approached in a round-about fashion, and constitutes the so-called problem of validity.

Assume that we have agreed on the meaning of "boring". What is then, "rather boring"? We do not know. The person's answer was too diffuse. In the semantic judgement method one attempts to obtain a more precise answer by, instead of posing a question to the person, letting him fill in a scale with e.g. the following appearance:

BORING

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

It is fair to assume that the more boring the person perceives the development to be, the further to the right he will place his tick. The semantic judgement scale can take various shapes, a few of which will be taken up for discussion.

Let us suppose that the person placed his tick in the sixth square from the left. We let a few weeks go by and then ask him

to make a new judgement. It is possible that he will tick the same square, but we must be prepared for a certain deviation, an intra-individual variation. The variation would partly depend on the person no longer regarding the development to be as boring as earlier. Thus, part of the variation corresponds to an actual change in his perception. The variation does, however, in part depend on flaws in the judgement procedure. The person may think that his first tick was slightly overdone and will be more careful the next time. These problems are dealt with under the heading "Reliability".

Nor can we be certain that the other persons who found themselves in the development will perceive or judge in the same way. Some of them may not find it boring at all. Furthermore, some may prefer to tick the centre of the scale, while others exaggerate either to the right or the left. The deviation between individuals, the inter-individual variation will be discussed in several different connections, it is, among other things, directly studied in connection with personality.

By letting all persons who found themselves in the development carry out judgements, we can estimate a group average and the distribution of the individuals around this average. It is then possible to compare the group with other groups. Even here, we have reason to expect variation, partly depending on systematic differences in perception between the members of the groups, partly depending on systematic variations in the judgement procedure. This group stability will be studied in a couple of sections.

Systematic differences between groups may, of course, depend on the sampling principle. A group of women may deviate in a definite way from a group of men. Various background data, such as age, profession, income, may be of importance here. There is, however, reason to emphasize the importance of two qualities which may have systematic influence on the results. The first of these is the time aspect. How much time has the person spent in the development or how often has he visited it? There are reasons for assuming that the perception will change with time. Secondly, the person's involvement in the development must be taken into account. What does it mean to him? Has he finally managed to take up residence there, or is he only visiting for a short time? In the former case, his viewpoint is more emotional, which may also influence perception and judgement. These problems will be returned to in time.

Could the estimate of boringness, which we have finally received, be considered a quality of the housing development? Or is it rather a perception of our subjects or perhaps just an artefact of the method seen from our own intuitive interpretation? The estimated boringness is, according to our opinion, all this at the same time i.e. a measure of the entire situation, where the housing development, the experimental subjects, the method of judgement and our own interpretation are necessary components. If the housing development is taken away, the whole thing would be meaningless. There is nothing to judge. If the persons are

taken away there is nobody to carry out the judgements. If the judgement method is taken away, there will be no results. And the results must be interpreted by someone. Thus, the estimated boringness is dependent on each and every one of these phases and a function of them.

We have, perhaps, remained at the boringness of the development for too long, and overlooked the fact that there are a number of other measures which may describe other aspects of the perception. The area may be judged as modern and airy, by some, as sterile and monotonous by others. How do these words connect? How many different dimensions of perception are there? Is there an infinite number, or perhaps just a few important main dimensions, which could be used for a simple and systematic description? Could the perceptions of different persons be described in the same dimensions and what, actually, is a dimension of perception? The major part of our work is an attempt to illuminate these questions.

1:3 THE SEMANTIC DIFFERENTIAL

In 1957, Osgood, Suci and Tannenbaum presented their work on the semantic differential. The authors intended to measure meaning, their book is also entitled: *The Measurement of Meaning*. They let experimental subjects judge concepts such as: Foreigner, Sin, Mother, America, or persons such as: Adlai Stevenson. They let the two poles of the rating scales be represented by descriptive words, which must also be pairs of opposites, e.g. HAPPY - SAD. After having studied a number of such pairs, the authors arrived at the conclusion that the semantic space had at least three major dimensions: evaluation, potency, activity. Furthermore, in certain experiments another few dimensions returned: stability, tautness, novelty and receptivity. Each concept could be given a position in this space. It here became apparent that certain pairs of adjectives could as a rule, be used as measures of evaluation (e.g.: GOOD - BAD, OPTIMISTIC - PESSIMISTIC, POSITIVE - NEGATIVE) while yet others measured potency (e.g.: HARD - SOFT, MASCULINE - FEMININE, STRONG - WEAK), activity (e.g.: ACTIVE - PASSIVE, EXCITABLE - CALM, COMPLEX - SIMPLE), stability (e.g.: SOBER - DRUNK, STABLE - CHANGEABLE, RATIONAL - INTUITIVE), tautness (e.g.: ANGULAR - ROUNDED, STRAIGHT - CURVED, SHARP - BLUNT), novelty (e.g.: NEW - OLD, UNUSUAL - USUAL, YOUTHFUL - MATURE) and finally receptivity (e.g.: SAVORY - TASTELESS, COLORFUL - COLORLESS, SENSITIVE - INSENSITIVE).

In order to compare different concepts, distance-scores (D-scores) were calculated, with the aid of which the semantic distances between a number of concepts could be represented in a D-matrix. A small distance implied close resemblance in meaning. This technique offered the possibility of not only studying the semantic world of a person, but also of comparing different groups (e.g.: the meaning of political terms to different electoral groups). The scales could be used for judging practically anything. However, this also proved to be a weakness, since a

pair of adjectives which in one case measured potency would, in another connection measure evaluation instead, etc. Many variables seemed simply to float around from factor to factor. On this, Osgood et al, say: "For purposes of generalized semantic measurement we would like to have a set of scales which consistently load heavily on a certain factor and are independent of other factors, despite variations in the concepts being judged. We have had difficulty trying to isolate a set of scales having these properties (p. 176). In the last analysis it may prove necessary to construct separate measuring instruments for each class of concepts being judged, but for both theoretical and practical reasons we hope this will not be the case" (p. 188).

In spite of the individual variables thus being of low validity sometimes, the authors were of the opinion that at least some of the factors were generally valid. "Although the meanings of individual scales and their correlation with each other may vary considerably from concept to concept, as we have seen, can essentially the same general factors be shown to repeat themselves despite concept variation. ... For every concept (a total of 19) being judged a factor clearly identifiable as evaluative could be found. (With a few exceptions) this factor was the first in order of magnitude ... However, the particular scales contributing to this factor vary markedly ... What is good depends heavily upon the concept being judged. The potency factor fares as well as evaluation. A correlate of this dimension of judgement appears for all concepts but two ... and there is a fair degree of consistency in the scales contributing. The activity factor, on the other hand, fares very poorly in these single-concept analyses ... The stability and receptivity factors appear with rather surprising regularity and consistency as to composition. A factor resembling stability can be identified with some assurance in all but four of the single-concept matrices. A receptivity factor could be identified in all but four concepts. However, this factor seems somewhat more diffuse in scale composition..." (pp. 180 - 186).

Osgood et al also applied their method within the field of experimental aesthetics. Since this field is fairly close to our own, it may be of interest to take up a few of their results. Apart from the problems outlined above on the generality of factors and variables, there will be cause to discuss two other qualities in the semantic model, what Osgood et al call: "the collapse of the semantic space", and "semantic chaos". The authors say, as an introduction: "To apply the semantic differential technique effectively in the study of aesthetics it is first necessary to determine the major factors or dimensions underlying aesthetic meanings. The particular instruments used, the specific scales selected, etc., depend upon such analysis. The factors operating in aesthetic judgements may be the same as those that appear in ordinary semantic judgements of linguistic signs, or they may be quite different." Then a study by Tucker is cited (1955), where a group of artists and a group of non-artists were to judge 11 paintings of which 4 were abstract. The analysis for the entire material gave three dimensions: activity, evaluation and potency, for both subject groups. When only the results of the abstract paintings were analysed, only an eva-

luation factor, however, was obtained for the artists. Osgood et al say here: "... this suggests that artists have highly polarized and emotional reactions to abstract painting which collapses the semantic space about a dominant single dimension. All scales of judgement tend to rotate toward this dominant dimension of evaluation... It also suggests that artists have explicitly worked out and agreed upon systems of evaluation; otherwise individual differences in scale allocation would wash out such a dominant factor." In the case of the non-artists a "semantic chaos" was obtained: "Although two factors accounted for a large part of the variance, the factors made no semantic sense whatsoever." The authors summarize the study in this way: "When either artists or non-artists judge representational paintings against a large number of scales, the dominant factors to appear are recognizable as the same as those derived from judgements of verbal concepts, evaluation, potency and activity, although the particular scales which represent these factors best in judging aesthetic objects are not necessarily the same and the activity factor has relatively more weight." (Osgood et al, 1957, pp. 291-295)

This study in experimental aesthetics has been used to shed light on some important characteristics in the semantic method. The generality of the factors, the tendency of the individual variables to float, the breakdown of the semantic space and semantic chaos, are problems, which time and again return in our own study. Osgood et al summarize their views on these problems after having cited a number of experiments from different fields: "What do these findings have to say about the practical problems of semantic measurement? For one thing, it now seems less likely that we will be able to discover a single set of scales which represent an adequate set of factors and which are stable across whatever concepts may be judged. On the other hand, it may be possible to identify classes of concepts for which general instruments may be used, and perhaps in course, the principles which operate in determining a common semantic frame of reference can be discovered." (p. 326) These words can be taken as a starting point for the work which is to be reported here.

The field we wish to measure is perception of man-made environment. We believe that within this field there are possibilities of isolating a limited number of general dimensions which can be individually measured, with scales constructed for this express purpose. If the perception of man-made environment proves to be too wide a field for one and the same measuring instrument we are prepared to divide the environment further, e.g. in interiors, housing, industrial and agricultural areas. We will take a stand on this question later on. The purpose is, however, not only to isolate certain dimensions (factors) and illustrate the way in which they are measured. We also wish, to the extent that definite factors are received, to attempt to find their meaning with the aid of other methods. This validating process which, according to Anastasi (1968): "...requires the gradual accumulation of information from a variety of sources", can never be completely binding. In this limited study we will not, of course, be able to make an acceptable validation for all aspects of the

semantic description of environment, such an aim would be too extensive. According to our opinion however, the important thing is, that a semantic analysis is not seen as anything final but rather as the opening of a new field, where later, among other things, validation is one of the great tasks. Our experiments on that point must therefore be regarded as a mere beginning.

1:4 THE FACTOR ANALYTICAL DESCRIPTION MODEL

As has been suggested in the previous section, we will use a factor analytical description model. The point of departure for such an analysis is a set of data, e.g. ratings in 100 different variables for 10 different environments. These 100 variables can be used exactly as they stand in order to describe and compare each environment or the whole group of environments. It is, however, probable that certain of the variables covary in some way. This may be especially true if they are chosen in a random or intuitive manner or if they are taken from different tests etc., which have not previously been compared. Such a co-variation can be interpreted in such a way, that these variables to some extent measure the same thing, and the question is whether there may be a few main dimensions in which one can describe one's material in a more simple way. In factor analysis one departs from a correlation matrix, where the correlation of each variable with each of the others is given and finally one ends up with a factor matrix, where instead, each variable is related to a number of main dimensions (factors).

If a correlation matrix is scrutinized, one often finds groups of variables which have a high mutual correlation but a low correlation with other groups. In the corresponding factor matrix such a group of co-varying variables instead form one factor, where these variables show high loadings. The factor is interpreted from what is known of the individual variables. A factor analysis is most advantageous if it shows that a large number of variables can be reduced to a few dimensions. Thus, the main purpose of the factor analysis is to obtain the most economical description of data.

Factor analysis can be carried out in a number of different ways and give an infinite number of solutions depending on the conditions stipulated. There is no solution which is the true or the best solution, but one can stipulate two criteria, which do not, unfortunately, lead to the same choice.

- a Statistical simplicity
- b Psychological meaningfulness

The psychological meaningfulness in various solutions has been debated ever since Charles Spearman developed his Two-Factor-Theory for intelligence, which defined a general factor and added to this a number of specific factors. The theory soon came to stand in opposition to L.L. Thurstone's Multiple-Factor-Theory. We would, however, support L.T. Kelley (1940), when he

says: "There is no search for timeless, spaceless, population-less truth in factor analysis; rather, it represents a simple, straightforward problem of description in several dimensions of a definite group functioning in definite manners, and he who assumes to read more remote varieties into the factorial outcome is certainly doomed to disappointment."

From this point of view, we have, in our choice of a factor analytical model, favoured the criterion: statistical simplicity. Then it also becomes natural to use Principal Component Solution with orthogonal rotation of the axes. Harman (1967) says: "If one were to make his choice entirely upon statistical considerations, a rather natural approach would be to represent the original set of variables in terms of a number of factors, determined in sequence so that at each successive stage the factor would account for a maximum of the variance. This statistically optimal solution (is) the method of principal axes..."

Thus, the type of factor analysis we use is not governed by any other principle than statistical simplicity. The use of orthogonal rotation of the axes means that the dimensions (factors) yielded are all independent and at right angles to each other in the same sense as height, width and depth in a room. There may be reasons for working with oblique rotation of axes, which means that the factors are no longer independent but correlated. Such a manner of approach may increase the possibility of meaningful interpretation of the dimensions, but demands a good knowledge of the field within which one is working, e.g. clear hypotheses concerning what factors can be expected and what they stand for. We do not have hypotheses of this exactitude and even if this were the case, strong motives are needed to deviate from the statistical simplicity as a basic principle. The only choice we have actually had to make is the number of factors in which we wish to describe our material. For this there are certain rules. This decision can, in most cases, be based on the size of the eigenvalues (Harman 1967, Kerlinger 1967). Our experience is that data which on the whole is suited for factor analysis results in a stable factor structure even if too many factors happen to be rotated. On the other hand, to rotate too few factors, i.e. attempt at describing one's data in too few dimensions, easily results in strangely mixed-up factors impossible to interpret.

Finally, it must be pointed out that the principle which is so to speak built into the factor analysis is the simple structure principle, which, among other things means that each variable must have as low a loading as possible in all factors except one, where, instead, the loading should be as high as possible. This is a built-in criterion the aim of which is to give maximum simplicity to the resulting matrix.

We will now describe the way in which our own data has been used for the purpose of factor analysis. The most general situation, which is present in main experiments 1 and 2 has the following appearance. A number of individuals i_1-i_N are rating a number of environments m_1-m_m in a number of variables v_1-v_n .

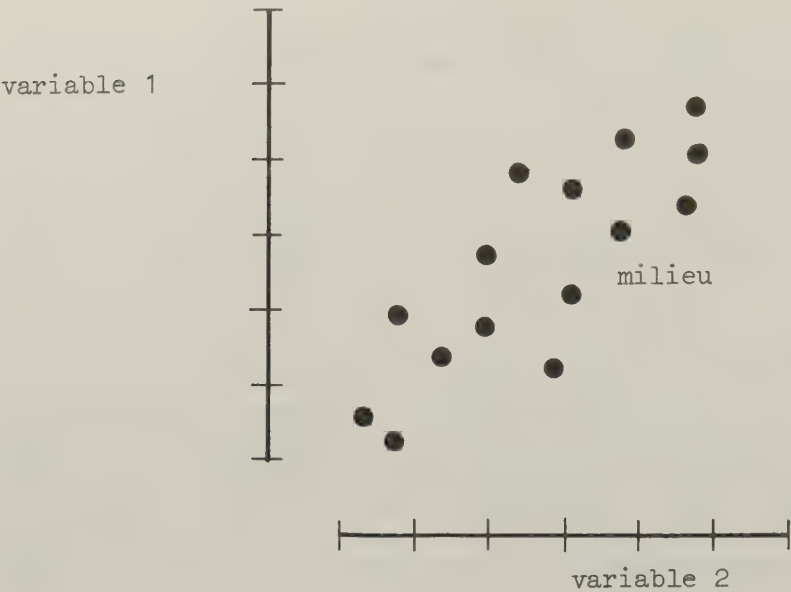
The matrix for variable 1 has the following appearance:

		milieu			
individual		1	2		m
	1	x_{111}	x_{121}		x_{1m1}
	2	x_{211}	x_{221}		x_{2m1}
	N	x_{N11}	x_{N21}		x_{Nm1}
		$x_{.11}$	$x_{.21}$		$x_{.m1}$

where x_{111} is the first individual's rating of the first environment in the first variable. Individuals as well as environments are regarded to constitute random samples from specified populations. Each individual rates each environment once in the respective variable. For each variable we then obtain one variation between individuals and one between environments. Either of these variations can be used to calculate those correlation coefficients which are to be the basis for the factor analysis. If one wishes to make use of the variance between environments, then a mean value over individuals has to be calculated for each environment. These mean values are then used for further calculations. With all variables shown, the matrix will take on the following appearance.

		variable			
milieu		1	2		n
	1	$\bar{X}_{.11}$	$\bar{X}_{.12}$		$\bar{X}_{.1n}$
	2	$\bar{X}_{.21}$	$\bar{X}_{.22}$		$\bar{X}_{.2n}$
	m	$\bar{X}_{.m1}$	$\bar{X}_{.m2}$		$\bar{X}_{.mn}$

Thus each cell contains a mean value of all the individual ratings for a definite environment in a definite variable. The correlations between variables are then calculated in the usual way.

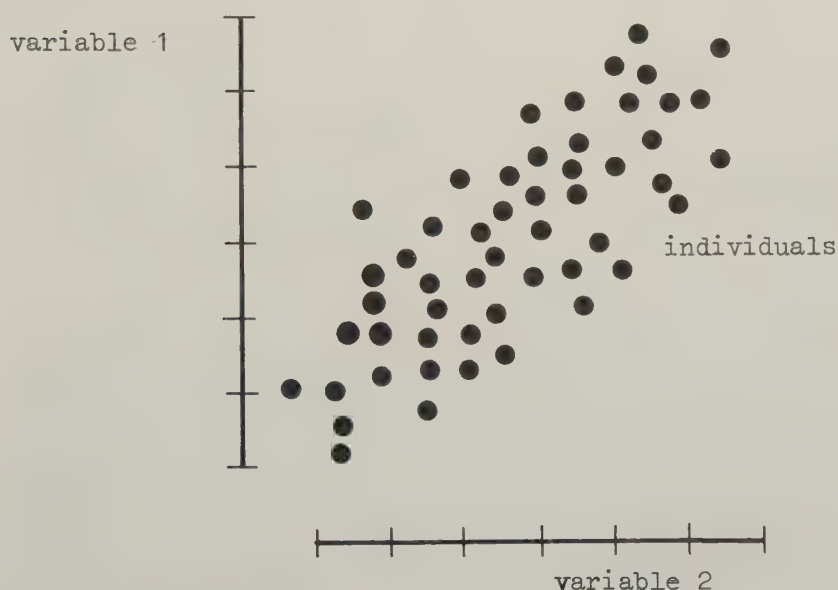


Thus each point here is the mean value over individuals, for one environment, and in this way the correlation between each pair of variables is calculated. r_{12} in the matrix below is the correlation between the first and the second variable. This matrix constitutes the starting point for the factor analysis.

		variable			
variable		v_1	v_2		v_n
	v_1		r_{12}		r_{1n}
	v_2	r_{21}			r_{2n}
	v_n	r_{n1}	r_{n2}		

What does this mean from the point of view of interpretation? Since the inter-individual variation has been reduced to mean values the factors say nothing directly about differences between individuals. Those dimensions (factors) which may be arrived at can instead be said to describe average differences between environments, as these have been judged by groups of individuals.

If, instead, one wishes to make use of the variation between individuals, the manner of approach will be different. This design has been used in some fullscale experiments and has the following appearance. A number of individuals i_1-i_N judge one environment in a number of variables v_1-v_n . We can directly calculate the correlation between each pair of variables over individuals.



Thus we get a correlation matrix which can then be factor analysed. The factors which may be obtained can in this case be regarded as describing the variation in the individual's judgement of this very environment.

Both these designs have definite advantages and disadvantages. Where the former is concerned, the factors which have been received can be seen as generally valid for the entire population of environments out of which we had drawn our sample. Those factors which were received in the latter design can, on the other hand, not be generalized for other environments. They are only valid for that very environment which has been judged. A decided drawback where the first design is concerned, is that the individual judgements are reduced to mean values. Those factors which then appear can thus not be directly considered to constitute dimensions in the individual's judgement of environment, while such an interpretation is fair in the other

design. We will, however, find that these two designs complement each other and make a wider interpretation possible. It is particularly important in each specific experiment to be clear on whether design 1 or design 2 has been used.

Here we should also mention something about the number of environments, variables and individuals which should be part of an experiment. Concerning design 2, the judgement of one environment, a stable factor structure is only obtained if the number of individuals is 5-10 times larger than the number of variables. For 80 variables one accordingly needs at least 400 subjects. This number can eventually be reduced somewhat if every subject is asked to make several ratings for every variable. As it is difficult to use such large groups one is often forced to accept factor structures which are less stable. One may even be content with about as many individuals as there are variables. In that case, however, the results must be interpreted with great care. Concerning design 1 the situation is different. In this case the factor analysis is based on the mean values for each environment over subjects. It seems possible to obtain a stable factor structure if (number of subjects) $\times$ (number of environments) is 5-10 times larger than the number of variables. Since the correlations are calculated over environments these should not be fewer than approximately 15 and the number of subjects should be sufficiently large to permit a generalization to the population of individuals. We will return to this problem in the discussion of group stability. (section 3:1)

It is customary to indicate how large a part of the total variance has come out in each factor. This proportion is expressed in percent and is, in our opinion, all too often regarded as a measure of the general importance of the factor. The proportion of variance which is accounted for by a factor depends on sampling of individuals as well as variables and in our case also environments. A relatively insignificant factor will account for more variance if the number of variables measuring this factor is increased. Another way of increasing the proportion of variance of a factor is to choose environments which vary particularly greatly in this dimension. By e.g. choosing extremely pleasant or unpleasant stimuli respectively, the variance in the evaluation-factor earlier described can be increased. Different types of experimental groups can also give rise to different proportions of variance. This was apparently the case in Tucker's experiment on judgement of abstract paintings.

There are a couple of cases where one is entitled to draw conclusions from the proportion of total variance. One is when different groups are put through the same experimental situation. The factor analyses are then comparable and a difference in factor variance can be directly related to differences between the groups. The other case is when a group is put through at least two experimental situations, e.g. evaluating two different housing developments. A change in the factors' proportion of the total variance can then be related to differences between the housing developments. A factor's proportion of the variance is, in most other cases, incidental. It is, however, possible that a comparison of several independent factor experiments

could give a correct notion of the relative significance of the factors. A condition for this is then that the sample of individuals as well as situations and variables is wide enough. It is enough for the variables which have been used to measure a certain dimension, to be inappropriate for the whole picture to become distorted.

In the factor matrices we will give the proportion of total variance accounted for by each factor. On the other hand, however, these proportions will not, for reasons mentioned above, be extensively discussed.

1:5 THE SHAPE OF THE RATING SCALE

We will discuss more closely some of the various types of rating scales which can be used in studies of environmental perception. The construction of scales is one of the pillars of natural sciences. Of what significance has not e.g. the introduction of uniform length, weight, and temperature units been? Within the behavioural sciences we can take as an example Thurstone's endeavours to create an attitude scale with psychophysics accuracy (Thurstone, Chave, 1929). Some time later, Likert simplified the method, when he introduced his well known scale steps: strongly agree (5), agree (4), uncertain (3), disagree (2), strongly disagree (1). Each step was given a simple weight from 5 to 1, which is shown in parentheses. The subjects were to take a stand on a number of items and their score for each item was simply summarized to obtain the total score. In spite of its simplicity, Likert's scale proved to agree well with the more refined method of Thurstone. (Likert, 1932)

Far later, Osgood, Suci and Tannenbaum developed the semantic differential, which took the following shape (Osgood et al, 1957):

FEMININE ____ : ____ : ____ : ____ : ____ : ____ : ____ MASCULINE

As to judgement, this meant nothing new. Instead it was the theoretical starting point and the processing which were important. This has been discussed above. We will, however, scrutinize this very scale a bit closer.

As we mentioned earlier it had seven steps and the end points were marked by pairs of opposites, e.g. FEMININE - MASCULINE. The centre of the scale was assumed to be neutral, i.e. neither FEMININE nor MASCULINE and therefore the scale can also be drawn in the following way.

FEMININE -3 -2 -1 0 +1 +2 +3 MASCULINE

The scale is assumed to be unidimensional and largely linear, which means that if it is followed from left to right, the degree of MASCULINE is assumed to increase evenly and to the same extent as the degree of FEMININE decreases. This means that an environment which has been judged maximally MASCULINE

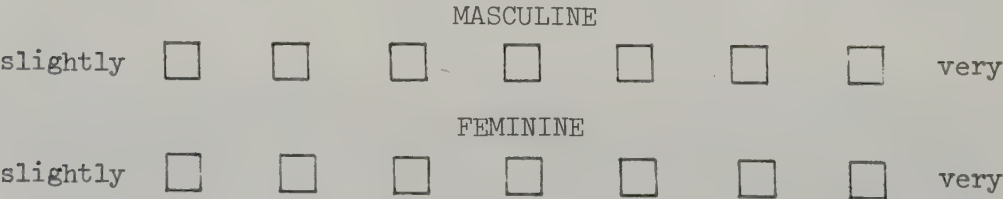
must by necessity be low in FEMININE. Sometimes this functions very well, but there are numerous exceptions. Suppose that a room has an atmosphere which seems half MASCULINE and half FEMININE e.g. a drawing room with a leather arm-chair, a pipe rack, lace curtains, pink table cloth and a vase. The judgement may seem to fall in the centre of the scale. Imagine another environment, a landscape with trees, bushes and a country road. This environment may be judged to be neither MASCULINE nor FEMININE but in spite of this the tick must here be placed in the centre of the scale. Thus, the words MASCULINE and FEMININE are, in certain cases opposed to each other, but sometimes independent of each other. There are also a number of adjectives which have no simple opposite or, as the case may be, several. What, e.g. is the opposite of timeless, encumbered, blue?

Even if two words in a definite situation are opposed to each other their mutual strength may give rise to another problem.



Opposed to the word PLEASANT, the one scale has the word BORING and the other the word UNPLEASANT. If a number of environments are to be judged using these scales, they work roughly the same way as long as the ticks are placed in the right half. But the less pleasant environments will pose problems. It takes quite a lot to place a tick in the square representing most UNPLEASANT. Due to the word UNPLEASANT being stronger than BORING, not only the centre of this scale will be deplaced to the right, but the intervals of the scale steps will also receive greater significance the more to the left they are located. Thus, it could be difficult, not only to find word pairs of opposite meaning but also of equal strength, particularly since the relative strength of the words varies when different things are to be judged. The word FEMININE has a different strength when it is used to characterize a man than when it is used for a drawing room.

These problems can, however, be avoided by letting the subjects manage all these decisions. For this reason we have constructed our scales in the manner illustrated below.



Thus each word is represented by one scale. In order to avoid mistakes in writing as well as in thinking we always let the right side of the scale contain "most" of the quality irrespective of whether this quality is positive e.g. GOOD, or negative, e.g. BAD.

Osgood et al were well aware of the problems sketched. They say:

"However, it still might be true that unidirectional scales would serve as well as those we now use. One of the difficult methodological problems we have faced - unsuccessfully so far - is to demonstrate that the polar terms we now use are true psychological opposites, i.e. fall of equal distances from the origin of the semantic space and in opposite directions along a single straight line passing through the origin." (Osgood et al, 1957, p. 327).

On condition that one is well acquainted with the function of a word-pair in a particular judgement situation it may, however, sometimes be proper to use both words in the same scale, either as opposites, in the manner of Osgood et al, or as synonyms.

SIMPLE/POOR

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

The word SIMPLE in itself, can be interpreted in at least the following ways: simple = modest; simple = poor; simple = uncomplicated; simple = vulgar. By using simple together with poor, these words will define each other. Words used in this way must, when interpreted, always be treated together as a unity. However, if one wishes, as we do, to arrive at suitable words in order to develop a measuring instrument, then the words should, at least to begin with, be used separately.

A further aspect of the rating scale is the number of steps to be used. There are scales running from just two steps and upward. The lower limit is dependent on the type of data desired, and the method of processing to be applied. If one desires a nuanced answer from each subject on each scale, at least five steps are needed (cf. the Likert-scale) but in such cases one can just as well use both seven and nine steps. If one is only interested in group results three steps can sometimes be sufficient and if a test consists of several different items, two steps for each item may be enough. In our opinion, the most important aspect is that the subjects find the scale meaningful. On the one hand, this demands an odd number of steps to give the possibility of a neutral judgement in the centre of the scale, on the other hand the subject must be able to express shades of difference. In an experiment, Stagner and Osgood (1946) among other things, found certain advantages with a seven step scale, from the point of view of the subject, and of the resulting distribution. They do, however, mention that schoolchildren seem to prefer five steps and that certain individuals among members of the American Legion only utilized three of the seven steps, namely positions 1, 4 and 7. Bopp (1955) found the same tendency in schizophrenic patients. We also found such a tendency in approximately 10 percent of the subjects in the most heterogeneous of our experimental groups, which was a random sample from the Malmö-Lund area. This has, on the other hand, not been the case in those groups consisting of high-school students, technology students etc.

In experiments of the type to be presented, more than seven steps will seldom be necessary. If more differentiated answers are required, one should consider other methods of judgement.

An alternative to the seven step scale is, however, a completely continuous scale, simply consisting of a line.

BORING

slightly _____ very

The subject can place his tick at whatever point on the line he wishes and the assessment is made by measuring the distance from the extreme left of the line to the tick. Aking, Sorte (1969:2) report an experiment where the complexity of 15 landscape slides were judged partly with a continuous scale and partly with a seven step scale. The correlation was linear, with a product moment coefficient of .98. The continuous scale can in certain cases be preferred from a statistical point of view, but it takes considerably longer to process, since each answer must be measured with a ruler. Those measuring situations we are talking about here are, furthermore, so unprecise that a more exact approach than the seven step scale seems unnecessary. The question of whether the latter should be regarded as an ordinal or an interval scale is impossible to answer in a general way. Since calculations with ranking as well as product moment procedure in our material have yielded approximately the same results, we have, however, for practical reasons, chosen to treat it as an interval scale.

To sum this up, we have worked with a seven step scale, originally of the following shape.

BORING

least ☐ ☐ ☐ ☐ ☐ ☐ ☐ most

As a result of comments from subjects we subsequently changed it thus:

BORING

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

This formulation was better understood by the subjects, but, according to our findings, did not result in any alteration of the results. In a few experiments the scale was given another shape, which can partly be understood by the text, partly by the respective appendices.

1:6 MANNER OF APPROACH

When one wishes to measure the perception of an environment and has decided on the measuring and processing methods there is one important and difficult question which remains. How are the environments to be presented to the subject? There are a number of various alternatives at hand.

The closest at hand is, perhaps, that of bringing the subjects to the environment, either singly or in group. Transporting

some 50 persons to around 15 different environments, and in a balanced order of presentation at that, i.e. so that some individuals are to judge the environment in one order, while others judge in a different order, does, however, present great practical difficulties. If one also has the weather to take into consideration, daylight etc., the resources will just not be sufficient.

Another way of managing design 1 would be to make use of persons who are visiting, working or living in the environments. One then gets different groups for the different environments. Even if these groups through careful sampling could be regarded as approximately equal, such an approach brings particular problems which will be presented later on. (section 3:2)

To be able to carry out design 1 at all, we have found it necessary to work with representation of environment, more precisely, with colour slides. Such a presentation is only visual and may of course lead to factors which are specific, distorted or completely inappropriate. On the other hand, the fact that we are quite familiar with pictures in our culture makes it possible for each one of us to enter into them. Through the perception process being an undivided unity, the visual stimulation also brings notions originally emanating from other sense modalities.

The practical difficulties are however small, where design 2 is concerned. When there is the question of letting a group of people judge only one environment, one can choose between bringing one's own subjects, or making use of persons who are already on the spot. We have therefore used design 2 to control the results from design 1.

We do, however, wish to remind our readers of the fact that the dimensions obtained according to design 1 describe average differences between environments while the dimensions obtained according to design 2 describe variation between individuals when judging a definite environment. One can not, without further ado, assume that the dimensions will be the same in both cases. There should, however, be a certain likeness, since the group mean values according to design 1 are based on the judgements of individuals. A reasonable difference between the dimensions received according to design 1 and design 2, should be that design 1 gives a more stable set of factors, since it must be valid for entire groups of individuals as well as for entire groups of environments. There is the risk, however, that some specific factor which would have been necessary to describe the individual variance for a certain environment, will disappear.

In design 2, on the other hand, it is possible for such specific factors to arise. On the other hand, one can not assume that the individual variation for each separate environment will give rise to an equally stable set of dimensions. One may, perhaps, expect that some of the more general design 1 dimensions will not be needed or that they are reduced to only one and that, at the same time, some new and specific dimension is brought out. As mentioned above, one may also expect

further dimensions because of the superiority of the full-scale presentation over the colour slides.

Departing from this reasoning, we will regard the factor structure which we eventually receive according to design 1, as a basic structure to be corrected and supplemented with the results from design 2.

There is, however, a practical aspect on the use of colour slides. One of the most important reasons for attempting to measure environmental perception is that the results can be used for purposes of prediction, i.e. to be able to judge future environment already at the planning stage, before it is built. Since designers of environment work with pictorial presentation throughout; sketches, perspective drawings, plastic models and model photography, it is of decided advantage if those measuring methods which are worked out can be used on such material. Simultaneously with this report, we present a comparison between different methods of presentation for planned environment (Acking, Sorte, 1972). The experience from this work indicates that pictorial presentations under favourable conditions may show great similarities to full-scale presentation in situ. Some of the results from this study will be discussed below in as far as they illustrate the factor analytical problems.

One can, of course, state that the dimensions according to design 1 and 2 will have nothing in common, that, from an operational point of view, they are completely separate. Osgood and his co-workers did, however, obtain similar factor structures when using individual judgements, when using the mean value for each individual over repeated judgements, as well as when using group averages. This supports us in our belief that the method of approach outlined above is justified.

Conditions such as instruction, orders of presentation, sampling of subjects, experimental situation and tables, will to a certain extent be presented in the appendix, in order not to burden the presentation unnecessarily. Only the most essential information will be given in the report proper. Therefore, there may be reasons for giving a general picture of how an experimental situation looks, before presenting the individual experiments. In the cases where we have deviated from the method of approach sketched in this section, this will be reported together with the experiment.

Design 1, i.e. a number of individuals judging several environments in different variables, has been carried out as group sittings in our studies. A number of individuals have been placed in a lecture hall or a room of similar nature, in such a way that they have all had access to a table and not been too close to their neighbour. The lighting in the room has been artificial and so strong that the persons could easily read their records, but weak enough for the exposed colourslide to be clearly seen. Direct lighting on the projection screen has been avoided. The strength of the lighting was tested in advance by means of measuring at table level. Type of projector with optics and lamp

as well as projection distance and size of the projected picture, have been constant within each experiment. The position of the subjects in the room has been such that nobody has obstructed the view of another person and nobody has been placed at a bad angle or unsuitable distance to the projected picture. The basis for judging this has been the experience of the experiment leaders, the influence of the visual conditions has not been systematically studied.

Before commencing the experiment, the background of the research was presented. The aim of the experiment was informed of in general terms, after which the procedure was explained. The response-record was looked at, and here we stressed the subjective nature of the judgement. A simple manner of correcting possible mistakes when marking ticks, was conveyed. The subjects were instructed to interpret the different variables themselves, to make all ticks and when making mistakes, to attract the attention of the experimental leader. In most cases there were three leaders, one of which handled the projector while the others circulated in the room for the purpose of controlling.

After demonstrating a test variable the experiment was effectuated. The environment slides were exposed with approximate 8-second intervals, of which 6.5 seconds constituted exposure time and 1.5 seconds changing time. The judgement was carried out while the slide was being exposed. A stop-watch was used. At each change, the experiment leader gave the number of the slide. After all slides had been judged in the first variable, the subjects turned a page in the record and read the next variable. Then the procedure was repeated with the slides constantly in the same order. When a mistake was made in the ticking, a short break was made for correction. All the experiment leaders experienced the subjects as highly motivated, with few exceptions, something which also became apparent through their own reports. They experienced the judgements as meaningful and sometimes amusing. The few exceptions which have appeared will be reported later.

The experimental design has, as a rule, been balanced. This means that the individuals who are to take part in the experiment are divided, at random, into sub-groups. The experiment is then carried out separately for these sub-groups, which each rates the environments in a different order. The environments have most frequently been presented in three orders so that each environment is presented to one sub-group at the beginning of the sitting, to one sub-group half-way through and to one sub-group at the end of the sitting. In this way the learning and tiredness aspects are kept under control. Three types of records have been used within each sub-group, so that the orders of the variables could also be balanced according to the same system.

The method of approach reported here, has been carefully adhered to in the two main experiments. However, those experiments where e.g. group stability has been studied, have often been somewhat simplified. The control of the experimental situation

as such has not been quite as comprehensive. The environments have only been presented in one order, although, with some exception, in the same order for different groups. As a rule, there has only been one order of presentation for variables. This simplified method has been necessary since the experiments were often conducted in unfamiliar places where it was impossible to choose a hall etc., with the same care. We therefore considered it practical to conduct a simplified standard procedure for this type of experiment. It should be pointed out that this lower degree of control increases the error variance of the estimate and thus work in a conservative direction towards our hypotheses. A result received under such conditions should be even more marked under more well-controlled conditions, provided that no systematic flaw has crept into the design.

Where design 2 is concerned, where the individuals only judge one environment, it is only the order of variables which has needed balancing. This has taken place in the manner mentioned earlier. The final standardization of the test constitutes an exception (section 4). There we have wished to keep a definite order of variables. However, the variables have here been sorted, in a way which nonetheless brings a balancing over factors. In full-scale experiments the subjects have, individually or in groups, been on the spot in the environment to be judged. We have allowed this type of experiments to run on for as long as was necessary.

2 FUNDAMENTAL EXPERIMENTS

2:1 JUDGEMENT OF 15 INTERIORS ACCORDING TO DESIGN 1

(MAIN EXPERIMENT 1)

The most important questions to start with were how to proceed in order to select variables and to study whether the manner of approach outlined would produce a result which, on the whole, was possible to interpret meaningfully. According to the plans, the first experiment should be of the design 1 type, and thus concern the judgement of a large number of environments. We did not want to risk obtaining an all too divided result and thus decided to use a relatively homogeneous sample of interiors, namely, drawing-rooms. As experimental subjects we chose a group of high-school students, who could be said to command a relatively homogeneous use of language.

Selection of variables

The first part of the study was aimed at selecting variables describing the perception of an interior from as many aspects as possible. Since a run-through of architectural literature and interviews with architects did not give any complete picture in this respect and since they could not be regarded as systematic either, these two methods were only used as supplements. Instead we went through the glossary of the Royal Swedish Academy (1950). All words which could be considered to describe an interior were selected (see APPENDIX A1). Each word was written on a card. On this card the synonyms of the words were also written, according to a dictionary of synonyms (Ord för Ord 1960). Then three judges carried out a subjective grouping of the words, so that words of similar meaning were brought to the same group. Approximately 1050 words were gone through in this manner.

The final selection was made according to the following criteria: The words were to be representative of their group, easy to understand, frequently occurring, meaningfully applicable to an interior and of contextual interest. The three judges together made a rough screening, after which they, independent of one another, chose words which were considered suitable. Words which were given three votes were chosen, after which the procedure was repeated with words given one or two votes respectively. Special consideration was given to words reported interesting by other researchers. The final number of words were 78 (see TABLE 1). The computer available could manage 80 variables.

Pictures

From the pictorial archives of a weekly magazine we chose all colour slides which satisfied the following criteria:

- a The slide was to depict a drawing-room, i.e. contain a seating arrangement, not only intended for meals.
- b The larger part of the room was to be visible in the slide.
- c There were to be no living creatures or special arrangements (such as a table with food etc.).

TABLE 1. Final sample of words for main experiment 1.

1 SERIOUS	27 HUMOROUS	53 RHYTHMICAL
2 ARCHITECTONIC	28 HARD	54 RED
3 DEPRESSING	29 HEALTHY	55 ELEGANT
4 COMFORTABLE	30 IMPRESSIVE	56 CLOSED
5 BLUE	31 INVITING	57 TASTEFUL
6 BOHEMIAN	32 INTERESTING	58 SUNNY
7 MIDDLE-CLASS	33 COLD	59 FORMAL
8 GOOD	34 DISMAL	60 OF PURE STYLE
9 MOTLEY	35 RURAL	61 STIMULATING
10 DISCREET	36 LIGHT	62 REplete WITH FEELING
11 DYNAMIC	37 AIRY	63 UNTIDY
12 EXPENSIVE	38 MASCULINE	64 COOL
13 CURIOUS	39 SOFT	65 TIMELESS
14 MONOTONOUS	40 MODERN	66 PLEASANT
15 SIMPLE	41 DARK	67 SECURE
16 IMAGINATIVE	42 NERVE-RACKING	68 BORING
17 POOR	43 HUMBLE	69 HEAVY
18 FEMININE	44 BADLY THOUGHT-OUT	70 QUIET
19 FINE	45 COSY	71 BEAUTIFUL
20 REPULSIVE	46 UNRESTFUL	72 ORDINARY
21 UGLY	47 PERSONAL	73 WARM
22 SOLID	48 PICTURESQUE	74 FRAGRANT
23 CHEERFUL	49 SPLENDID	75 WELL-KEPT
24 GREEN	50 PRETENTIOUS	76 DESOLATE
25 YELLOW	51 SOOTHING	77 OPEN
26 HARMONIOUS	52 SPACIOUS	78 ENCUMBERED

(To find the Swedish words actually used in the experiments, consult the English-Swedish word-list in APPENDIX H1, which also contains a translation of the factor names.)

- d The light was to be mainly daylight or of a general character.
- e There were to be no abnormal colour shades.

Approximately 35 pictures filled these requirements according to subjective judgements by the judges mentioned earlier. Out of these, 15 were randomly selected (see ILLUSTRATION 1). Thus, the slides were not chosen for architectonic reasons. They were copied to the same size (24x36 Ektachrome X) whereby smaller colour and light deviations were corrected according to conventional laboratory techniques. (The orders of presentation are found in APPENDIX A2.)

Rating scales

The response records were constructed in such a way that each page contained one variable, which was printed at the top of the page. The page contained 15 rating scales numbered 1 to 15, one for each interior (APPENDIX A3). The scales had seven steps, and were marked with the words least to the left and most to the right.

Experimental subjects

The experiment was carried out three times with approximately 14 subjects each time. Altogether 42 subjects took part, approximately the same number of men and women at each sitting (see APPENDIX A4). The subjects were pupils from the second form of a high-school in Lund, and were randomly selected from a population of approximately 120. Out of the 43 summoned, one did not take part and one was later eliminated because of colour weakness.

Procedure

Described under point 1:6 and in APPENDIX A5.

Results

An arithmetical mean value in each variable was calculated for each of the 15 interiors, based on the judgements of 41 individuals. These mean values then constituted the basis for a correlation matrix, where the correlations of each variable with all the others were calculated according to a product-moment approach. The correlation matrix was factor analysed. Much information can be obtained from the material. Here we will, however, only deal with the result of the factor analysis.

10 factors with high loadings were obtained. All are interpretable. Each of these factors contained at least some loading larger than .55. The last five factors contained no loadings over .22. A processing where a fewer number of factors were rotated would therefore seem ideal, but the result proved to be almost identical with the previously obtained structure, which was therefore maintained (TABLE 2).

The outcome of the subjective interpretation is reported in the following way. A variable is ascribed to a factor if it has the highest loading in this factor. Single exceptions are made for factors which contain only a few variables, which, in that case, will be in parentheses. In factors with many high

	I	II	III	IV	V	VI	VII	VIII	IX	X
26 HARMONIOUS	-.95									
27 HUMOROUS	-.62	.50	-.33		.33					
28 HARD	.85		-.34							
29 HEALTHY	-.86									
30 IMPRESSIVE	-.69	-.69								
31 INVITING	-.96									
32 INTERESTING	-.92			-.30						
33 COLD	.78		-.56							
34 DISMAL	.48		.57						.40	
35 RURAL	.47					.82				
36 LIGHT	.49		-.78							
37 AIRY			-.97							
38 MASCULINE	-.75							.50		
39 SOFT	-.78	-.37	.31							
40 MODERN	-.65		-.36			-.49				
41 DARK	-.46		.79							
42 NERVE-RACKING	.95									
43 HUMBLE	.79	.56								
44 BADLY THOUGHT-OUT	.57	.57					-.42			
45 COSY	-.80		.51							
46 UNRESTFUL	.40	.54			.65					
47 PERSONAL	-.89									
48 PICTURESQUE			.36			.89				
49 SPLENDID	-.45	-.87								
50 PRETENTIOUS	-.35	-.92								
51 SOOTHING	-.88	-.32								
52 SPACIOUS	-.39	-.30	-.76							

TABLE 2, cont'd

	I	II	III	IV	V	VI	VII	VIII	IX	X
53 RHYTHMICAL	-.86	-.32								
54 RED	-.35									-.86
55 ELEGANT	.55	-.72								
56 CLOSED			.96							
57 TASTEFUL	-.87	-.45								
58 SUNNY			-.79						-.32	
59 FORMAL	.90									
60 OF PURE STYLE		-.45					.78			
61 STIMULATING	-.98									
62 REPLETE WITH FEELING	-.81		.41							
63 UNTIDY		.54	.44		.68					
64 COOL	.64		-.74							
65 TIMELESS	-.32			.75		.44				
66 PLEASANT	-.98									
67 SECURE	-.87		.41							
68 BORING	.98									
69 HEAVY		-.58	.71							
70 QUIET		-.59	.31		-.58				.35	
71 BEAUTIFUL	-.77	-.55								
72 ORDINARY				.82						
73 WARM	-.81		.50							
74 FRAGRANT	-.78	-.33	-.36							
75 WELL-KEPT		-.85			-.38					
76 DESOLATE	.65		-.57		-.33					
77 OPEN			-.97							
78 ENCUMBERED			.74	.31	.46					
Proportion of total variance in %	47	18	16	5	4	3	2	1	1	1

loadings, only the highest have been included. For the sake of lucidity we have divided the variables into positive and negative and then arranged them according to the size of the loadings. The loading which is written in front of each variable indicates to what extent the variable correlates with the entire factor. The sign of the loading only shows the relation of the variable to other variables within the same factor. We have attempted to give each factor a name, which is indicated by underlining.

Factor I obtained high loadings in the following variables:

+		-	
.98	BORING	.98	STIMULATING
.97	REPULSIVE	.98	PLEASANT
.95	UGLY	.97	GOOD
.95	NERVE-RACKING	.96	INVITING
.93	DEPRESSING	.95	HARMONIOUS
.90	FORMAL	.92	INTERESTING
.85	MONOTONOUS	.90	DYNAMIC
.85	HARD	.89	PERSONAL
.79	HUMBLE	.88	SOOTHING
.78	COLD	.87	TASTEFUL
		.87	SECURE
		.86	HEALTHY
		.86	RHYTHMICAL
		.83	COMFORTABLE
		.81	REPLETE WITH FEELING
		.81	WARM
		.80	COSY
		.79	IMAGINATIVE
		.78	SOFT
		.78	FRAGRANT
		.77	BEAUTIFUL
		.75	MASCULINE
		.74	CHEERFUL
		.65	MODERN

There seems to be a connection between this factor and the feeling of pleasantness, security and adjustment that the individual experiences in the interior, i.e. a judgement of pleasantness. This is reflected in the commentary the experimental subjects gave, that "rooms one likes obtained a high rating". No doubt this factor, which accounts for a great deal of the variance, corresponds to Osgood's evaluation-factor, which has, thus, proved to turn up even in the matter of judging interiors.

Factor II obtained high loadings in the following variables:

+		-	
.76	POOR	.92	PRETENTIOUS
.73	SIMPLE	.89	EXPENSIVE
		.87	SPLendid
		.85	FINE
		.85	WELL-KEPT
		.77	MIDDLE-CLASS
		.72	SOLID
		.72	ELEGANT
		(.69	IMPRESSIVE)

The factor seems to imply a judgement of the social status of the interior.

Factor III obtained high loadings in the following variables:

+		-	
.96	CLOSED	.97	AIRY
.79	DARK	.97	OPEN
.74	ENCUMBERED	.79	SUNNY
.71	HEAVY	.78	LIGHT
		.76	SPACIOUS
		.74	COOL
		.69	BLUE

This factor seems to imply a judgement of the space of the interior, its lighting and the way it is demarcated, i.e. what in architecture is often termed enclosedness.

Factor IV obtained high loadings in the following variables:

+		-	
.82	ORDINARY		
.75	TIMELESS	.75	CURIOUS

This factor seems to encompass on the one hand the universal, on the other hand the deviating. It seems to describe the originality of the interior.

Factor V obtained high loadings in the following variables:

+		-	
.87	MOTLEY	.84	DISCREET
.68	UNTIDY	(.58	QUIET)
.65	UNRESTFUL		

The factor probably reflects the liveliness and complexity in the interior. It seems to be closely connected with interior design, colour composition etc. It should, on the whole, correspond to Osgood's activity-factor.

Factor VI obtained high loadings in the following variables:

+		-	
.89	PICTURESQUE	(.49	MODERN)
.82	RURAL		
(.44	TIMELESS)		

This factor points to a feeling for the old, the rural, the genuine. Work designation is affection factor.

Factor VII obtained high loadings in the following variables:

+		-	
.78	OF PURE STYLE	(.42	BADLY THOUGHT-OUT)

The factor may reflect the degree of uniformity and balance in the interior. It should be illustrated by more variables before

a definite interpretation is made. For the time being we will call it unity factor.

Factor VIII obtained high loadings in the following variables:

+	-
(.50 MASCULINE)	(.55 FEMININE)

These two loadings are reasonably high and show that there may be a sex aspect for interiors, i.e. that one associates the different rooms to one sex or the other. The factor may possibly correspond to Osgood's potency-factor and is therefore, for the time being, called potency.

Factor IX

+	-
	.89 YELLOW

The factor probably does reflect a pure colour aspect in the interiors and is of slight interest in this connection.

Factor X

+	-
	.86 RED

The factor seems to depend directly on the colour of the interiors. It is uninteresting in this connection.

Discussion

One single experiment of the kind presented here must of necessity give a one-sided picture. Several limitations in generality have already been mentioned. They will be summarized here. To what extent perception can be measured by means of a rating method is a partly unsolved question. The use of colour slides instead of actual interiors may have thwarted the results, among other things due to the fact that only the visual modality has been represented. The results may become different if the observers stay in the interior for a long time, from what it is when they only shortly observe it in a test situation. Furthermore, the material is limited to the interior of drawing rooms. The experimental subjects used must be regarded as a relatively homogeneous group and are not representative of a general population. We do, however, hold the opinion that our hypothesis has partly been strengthened. It has proved possible to divide the description of an environment in separate factors. Those factors which have been obtained have been easy to interpret although it was in no way evident that the grouping would turn out the way it did. Future experiments will show whether the factors are suitable for environment in general. One must take into account the possibility of single new factors appearing in other types of environment while perhaps some of the above will disappear or must be given a better interpretation.

2:2 JUDGEMENT OF A FULL-SCALE INTERIOR ACCORDING TO DESIGN 2

The factor structure in the previous experiment was surprisingly unambiguous and stable, even if certain factors were difficult to interpret because of the loadings being too low. As could be expected, when Principal Component Solution was used, the largest part of the variance had been drawn to the first factors and the randomly selected variables were quite naturally not sufficient to load the last factors satisfactorily.

There were now two ways in which to continue. The experiments with colour slides could either be repeated with other samples of individuals and environments as well as variables (design 1). This would lead to a more distinct interpretation of factors on the one hand and on the other hand to information on what variables measured certain factors in a stable manner and which "floated" i.e. easily came out in other factors. As we have mentioned earlier, one of the greatest problems Osgood and his colleagues had was to find variables which always came out in the same factor, irrespective of what was judged.

The other possibility was to wait with this and instead go straight on to a full-scale situation according to design 2. This would provide a rough check on the generality of the factors for describing individual variations in an actual environment. We judged this latter alternative as more urgent. In order not to go too far it may be suitable to let the environment consist of an interior of the same type as in the previous experiment, i.e. a drawing-room and also stick to the same type of experimental subjects.

Interior

An interior of a drawing-room 610 cm long, 370 cm wide and 250 cm high, was used as stimulus. It was equipped with a door and a window. The ceiling and the walls were painted white and the floor grey. It was furnished as a conventional Swedish drawing-room of the 60's, with a seating arrangement and a dining recess. A television set was placed in a combined repository-cum-bookcase. Furthermore, there was a carpet, curtains, lamps and reproductions. (A more detailed description is given in APPENDIX B1.)

Variables

The 78 variables were exactly the same as in the previous experiment (see TABLE 1 in section 2:1). Each was presented as earlier, in the shape of a seven step rating scale and these were compiled in three different orders for the record (see APPENDIX B2).

Experimental subjects

These consisted of 63 first-year students from the Section of Architecture, the Lund Institute of Technology. At the time of the experiment they had studied architecture for one term, so their knowledge of the subject was slight. They

can, on the whole, be compared to the group of high-school students used in the previous experiment. They may, because of their line of study, have a higher motivation for judging environments. All subjects were asked about visual acuity and possible colour weakness. Spectacles were allowed. No serious disturbances were reported (APPENDIX B3).

At the same time as the experiment constituted a control of the earlier factor analysis, it was part of a larger experiment where the aim was to compare film-presentation of an environment with a full-scale presentation (Acking, Küller 1968:2). The only way this affects the experiment at hand is that 27 of the experimental subjects had already seen and judged a film version of the interior. This implies that roughly half of them are more used to the rating method but at the same time have a certain handicap since they had already seen the room on film. It appears, from the results of the comparison between film and full-scale, that the order of presentation has had a significant effect on the full-scale ratings in 28 of the 78 variables. Where the factor analysis is concerned this implies that the structure may be somewhat less stable.

Procedure

The full-scale experiments (in the interior) were made in such a way that the subjects, one by one, received their record in an ante-room. The first page of this record contained a written instruction, where the method of response was informed of in words and with an example. The subjective nature of the judgements was stressed and the subjects were urged to make use of the entire scale and to make rapid ratings. Possible questions were answered after which the subject went into the drawing-room alone, closing the door. When he had filled in the form, he came out and the door was closed again.

Results

The full-scale ratings were factor analysed in the manner described earlier under design 2 (section 1:4). The factor structure was, as expected, not as stable as in the former experiment. This is mainly due to the small number of subjects. The first three factors could, however, be given a clear interpretation (TABLE 3). They are presented in the same manner as in the former experiment.

As in the former experiment, factor I is constituted by pleasantness judgements.

-		+	
.65	FORMAL	.78	IMAGINATIVE
.41	BORING	.76	PERSONAL
		.57	STIMULATING
		.56	INVITING
		.56	REPLETE WITH FEELING
		.55	PICTURESQUE
		.53	PLEASANT
		.49	INTERESTING
		.48	DYNAMIC
		.47	HUMOROUS
		(.44	BEAUTIFUL)
		.41	HARMONIOUS
		.40	COSY

TABLE 3. Distribution of variables on different factors when judging an interior. All loadings $\geq .30$, have been included.

	I	II	III
1 SERIOUS			
2 ARCHITECTONIC			
3 DEPRESSING			
4 COMFORTABLE			
5 BLUE			
6 BOHEMIAN			
7 MIDDLE-CLASS			
8 GOOD		.38	
9 MOTLEY		-.64	
10 DISCREET		.85	
11 DYNAMIC	.48		
12 EXPENSIVE			
13 CURIOUS			-.37
14 MONOTONOUS			
15 SIMPLE			
16 IMAGINATIVE	.78		
17 POOR			
18 FEMININE			
19 FINE			
20 REPULSIVE			
21 UGLY			
22 SOLID			
23 CHEERFUL	.38		.30
24 GREEN			
25 YELLOW		.32	

	I	II	III
26 HARMONIOUS	.41	.32	
27 HUMOROUS	.47		
28 HARD			
29 HEALTHY			
30 IMPRESSIVE			
31 INVITING	.56		
32 INTERESTING	.49		
33 COLD			
34 DISMAL			
35 RURAL			.42
36 LIGHT			.85
37 AIRY		.33	.43
38 MASCULINE			
39 SOFT			
40 MODERN			
41 DARK			-.87
42 NERVE-RACKING			
43 HUMBLE			
44 BADLY THOUGHT-OUT			
45 COSY	.40		
46 UNRESTFUL		-.61	
47 PERSONAL	.76		
48 PICTURESQUE	.55		
49 SPLENDID			
50 PRETENTIOUS			
51 SOOTHING		.47	
52 SPACIOUS		.36	

TABLE 3, cont'd

	I	II	III
53 RHYTHMICAL			
54 RED			
55 ELEGANT			
56 CLOSED			
57 TASTEFUL	.39		
58 SUNNY			.47
59 FORMAL	-.65		
60 OF PURE STYLE		.33	
61 STIMULATING	.57		
62 REplete WITH FEELING	.56		
63 UNTIDY			
64 COOL			
65 TIMELESS			
66 PLEASANT	.53		
67 SECURE			
68 BORING	-.41		
69 HEAVY			
70 QUIET			
71 BEAUTIFUL	.44	.45	
72 ORDINARY	-.30		
73 WARM			
74 FRAGRANT		.53	.31
75 WELL-KEPT			
76 DESOLATE			-.33
77 OPEN		.34	(.28)
78 ENCUMBERED			
Proportion of total variance in %	18	8	6

Factor II is a complexity factor.

-		+	
.64	MOTLEY	.85	DISCREET
.61	UNRESTFUL	.53	FRAGRANT
		.47	SOOTHING
		.45	BEAUTIFUL

Factor III is an enclosedness factor.

-		+	
.87	DARK	.85	LIGHT
		.47	SUNNY
		.43	AIRY
		((.28	OPEN))

Discussion

We have established that only three factors are possible to interpret. The less stable factor structure, which is a result of the experimental conditions, make the loadings lower, which naturally has as a result that possible further factors disappear. It does, however, become apparent that all three factors in this experiment were also obtained in the former experiment. Factors I, II and III correspond to earlier factors I, V and III. In factor analyses of two different situations one must always take into account the possibility that the order of factors is changed. Thus, no new factors were obtained when the experiment was carried out according to design 2.

We can therefore feel supported in our opinion that, in principle, the same factor structure can be expected according to designs 1 and 2. As has been mentioned earlier, this would mean that the dimensions which are valid for describing average differences between environments can also be used to describe the variance between individuals when judging one single environment.

Concerning the stability of the separate scales in order to measure a certain factor, this can not be determined on the basis of this material but we can still obtain some clues. Out of the 15 variables which came out in the first factor, 14 are found in factor I in the first experiment. The 3 variables which had the highest loadings in factor II are found among the 4 variables which had high loadings in factor V in the former experiment. MOTLEY and DISCREET obtain the highest loadings in both cases. All 5 variables in the third factor are also found in the former experiment in factor III. A certain displacement can, however, be traced here. While, earlier, the words describing space, e.g. CLOSED, AIRY and OPEN were highest, it is instead the words relating to light, LIGHT and DARK, which now have the highest loadings. Whether or not this is accidental is difficult to say. There is cause for giving particular attention to these two aspects of the enclosedness factor in the future.

2:3 JUDGEMENT OF A FULL-SCALE EXTERIOR ACCORDING TO DESIGN 2

The concordance between the results in the two previous experiments was so great that we decided to further postpone a repetition of design 1 with new individuals, environments and variables and instead apply design 2 to an exterior environment. The main reason for this was that design 2 only demanded a fraction of the preparations needed for design 1, and we wished to gain further experience before we took on such an experiment again. It was clear to us that such an experiment should be carried out on a more general sample of environments, interiors as well as exteriors, and that therefore there was cause to conduct a design 2 experiment on an exterior first, to see whether any new factors would come out or whether the earlier would reappear here as well.

In order to obtain material for the factor analysis we let a number of high-school students rate a housing development. The choice of high-school students was made so that the group would have the same character as in the two earlier experiments. As regards the environment it was desirable from the point of view of judgement to choose a clearly defined area of a definite character and therefore the choice quite naturally fell to a housing development.

Variables

Those variables used earlier had, among other things, been chosen to be meaningfully applicable to interiors (see TABLE 1 in section 2:1). Therefore it was necessary to scrutinize them and exclude those which were not relevant to exteriors. The words which were excluded at this scrutiny were: COMFORTABLE, SOLID, HUMOROUS, COSY and ELEGANT. We further excluded SUNNY and FRAGRANT, which were considered too physically obvious in a full-scale situation. The colour concepts BLUE, YELLOW and RED were deleted since they had earlier been considered fairly uninteresting. GREEN, on the other hand, was kept, since this could be connected with greenery and was thus relevant from an architectural point of view. Instead 10 new variables were chosen: UNITARY, CLUTTERED, IDYLIC, INSIGNIFICANT, CALM, VARIED, ORIGINAL, STERILE, WELL-PLANNED and FRIENDLY, which were considered relevant in this new connection. Thus, 68 of the original 78 variables were kept and 10 were added (see TABLE 4). The selection was made by the same judges as earlier.

As earlier, each variable constituted a seven step rating scale. These scales were stenciled in records, made in three versions to balance the order of presentation (APPENDIX C1).

Exterior

It was decided that the environment was to be a housing development in Lund, that it should be the result of conscious planning and comply with the conditions of the town plan. For this reason two architects collaborated to choose a development consisting of yellow brick bungalows grouped around commons. The

TABLE 4. Final sample of words for judging exteriors.

1 SERIOUS	27 HARD	53 SPACIOUS
2 ARCHITECTONIC	28 HEALTHY	54 RHYTHMICAL
3 DEPRESSING	29 IMPRESSIVE	55 CLOSED
4 BOHEMIAN	30 INVITING	56 TASTEFUL
5 MIDDLE-CLASS	31 INTERESTING	57 FORMAL
6 GOOD	32 COLD	58 STERILE
7 MOTLEY	33 DISMAL	59 OF PURE STYLE
8 DISCREET	34 RURAL	60 STIMULATING
9 DYNAMIC	35 LIGHT	61 REplete WITH FEELING
10 EXPENSIVE	36 AIRY	62 UNTIDY
11 CURIOUS	37 CALM	63 COOL
12 MONOTONOUS	38 MASCULINE	64 TIMELESS
13 UNITARY	39 SOFT	65 PLEASANT
14 SIMPLE	40 MODERN	66 SECURE
15 IMAGINATIVE	41 DARK	67 BORING
16 POOR	42 NERVE-RACKING	68 HEAVY
17 FEMININE	43 HUMBLE	69 QUIET
18 FINE	44 BADLY THOUGHT-OUT	70 BEAUTIFUL
19 REPULSIVE	45 VARIED	71 ORDINARY
20 UGLY	46 ORIGINAL	72 WARM
21 CHEERFUL	47 UNRESTFUL	73 WELL-PLANNED
22 GREEN	48 PERSONAL	74 WELL-KEPT
23 CLUTTERED	49 PICTURESQUE	75 FRIENDLY
24 IDYLLIC	50 SPLENDID	76 DESOLATE
25 INSIGNIFICANT	51 PRETENTIOUS	77 OPEN
26 HARMONIOUS	52 SOOTHING	78 ENCUMBERED

(To find the Swedish words actually used in the experiments, consult the English-Swedish word-list in APPENDIX H1, which also contains a translation of the factor names.)

houses are of the atrium type, built in 1958 (APPENDIX C2).

Experimental subjects

We used second-year students from a three-year high-school in Lund. They lived in Lund and their ages varied from 16 to 19 years. From a population of 120, 50 were chosen at random, of which half were male and half female. They were divided into three groups, which were given records with different orders of presentation of the variables.

Procedure

The experiment took place at the end of May in the afternoon and continued from noon until roughly 6 o'clock p.m. The weather was sunny with light clouds and the temperature was pleasant. The subjects arrived at the development in small groups of 2-6 persons. The aim of the experiment was outlined in general terms, and subjects were given time to read the instructions at the front page of the record. They were, at the same time, given a sketch of the development, corresponding to APPENDIX C2. The subjective nature of the ratings was stressed. The subjects were instructed to interpret the different variables themselves, to carry out all markings and to attract the attention of the experiment leader when making mistakes. After demonstrating a test variable (PLEASANT) the subjects were urged to walk around the development before commencing the rating. From their own comments, they seemed to be highly motivated and to experience the procedure as meaningful.

Results

The raw data obtained was processed according to design 2. The judgements of the individuals formed the basis for a matrix where the correlations of each variable with all the others were calculated by a product moment approach. Nor in this experiment, was the factor structure as stable as in the first one (TABLE 5). Only four factors could be given a clear interpretation. These are presented here in the same way as earlier.

Factor I obtained the highest loadings for the following variables:

-		+	
.86	UGLY	.83	PLEASANT
.85	REPULSIVE	.78	INVITING
.75	CURIOUS	.70	FRIENDLY
.73	BORING	.69	GOOD
.72	DEPRESSING	.66	CHEERFUL
.70	HEAVY	.64	TASTEFUL
.63	NERVE-RACKING	.62	BEAUTIFUL
.58	HARD	.60	STIMULATING
.58	INSIGNIFICANT	.52	REPLETE WITH FEELING
.56	DISMAL	.46	SPACIOUS
.56	CLOSED	.43	SOOTHING
.56	ENCUMBERED		
.51	SERIOUS		
.48	MONOTONOUS		
.48	FORMAL		
.44	COLD		

TABLE 5. Distribution of variables on different factors when judging an exterior. All loadings $\geq .30$, have been included.

	I	II	III	IV
1 SERIOUS	-.51			
2 ARCHITECTONIC	.37			
3 DEPRESSING	-.72		-.34	
4 BOHEMIAN		.36		
5 MIDDLE-CLASS		-.30		
6 GOOD	.69			
7 MOTLEY			-.65	
8 DISCREET				
9 DYNAMIC				
10 EXPENSIVE				
11 CURIOUS	-.75	.38		
12 MONOTONOUS	-.48			
13 UNITARY				
14 SIMPLE				
15 IMAGINATIVE	.43	.47		
16 POOR				-.44
17 FEMININE				
18 FINE	.39			
19 REPULSIVE	-.85			
20 UGLY	-.86			
21 CHEERFUL	.66			
22 GREEN				
23 CLUTTERED	-.41		-.37	
24 IDYLIC	.40			
25 INSIGNIFICANT	-.58			

TABLE 5, cont'd

	I	II	III	IV
26 HARMONIOUS				
27 HARD	-.58			-.44
28 HEALTHY	.31			
29 IMPRESSIVE	.37			
30 INVITING	.78			
31 INTERESTING	.36	.45		
32 COLD	-.44			
33 DISMAL	-.56			
34 RURAL				
35 LIGHT				.83
36 AIRY	.33			.74
37 CALM			.44	
38 MASCULINE				
39 SOFT	.31			
40 MODERN		.35		.42
41 DARK			-.34	-.63
42 NERVE-RACKING	-.63			
43 HUMBLE	-.42			
44 BADLY THOUGHT-OUT	-.32		-.63	
45 VARIED				
46 ORIGINAL		.85		
47 UNRESTFUL			-.70	
48 PERSONAL		.34		
49 PICTURESQUE				
50 SPLENDID				
51 PRETENTIOUS				
52 SOOTHING	.43		.33	

	I	II	III	IV
53 SPACIOUS	.46			
54 RHYTHMICAL				
55 CLOSED	-.56			
56 TASTEFUL	.64			
57 FORMAL	-.48			-.42
58 STERILE	-.39			
59 OF PURE STYLE			.62	
60 STIMULATING	.60			
61 REplete WITH FEELING	.52			
62 UNTIDY			-.87	
63 COOL		.35		.33
64 TIMELESS				
65 PLEASANT	.83			
66 SECURE			.43	
67 BORING	-.73			
68 HEAVY	-.70			
69 QUIET			.56	
70 BEAUTIFUL	.62			
71 ORDINARY		-.70		
72 WARM	.39			
73 WELL-PLANNED	.36			
74 WELL-KEPT			.43	
75 FRIENDLY	.70			
76 DESOLATE	-.35			-.34
77 OPEN	.37			.73
78 ENCUMBERED	-.56		-.31	
Proportion of total variance in %	28	8	7	5

Once again pleasantness comes out as the first factor.

Factor II can evidently be interpreted as originality partly because ORDINARY returns but also because the new variable ORIGINAL is given the highest loading.

-		+	
.70	ORDINARY	.85	ORIGINAL
		.47	IMAGINATIVE
		.45	INTERESTING
		(.38	CURIOUS)
		.36	BOHEMIAN

The third factor, again, implies complexity.

-		+	
.87	UNTIDY	.62	OF PURE STYLE
.70	UNRESTFUL	.56	QUIET
.65	MOTLEY	.44	CALM
.63	BADLY THOUGHT-OUT		

And the fourth is an enclosedness factor.

-		+	
.63	DARK	.83	LIGHT
		.74	AIRY
		.73	OPEN

Discussion

The four factors, which together account for 48 percent of the total variance, are directly comparable to those obtained in the first experiment (2:1) and which were then called pleasantness, originality, complexity and enclosedness. They also show high similarity with the factor structure obtained for an interior judged in full-scale (2:2).

Thus, the factor structure from main experiment 1 has so far proved to cover full-scale judgement of an interior as well as a housing development.

2:4 SOME CITED EXPERIMENTS

There is a large number of factor analytical studies, which more or less touch upon the field in question. Two of them will be taken up for a closer discussion.

In a series of experiments entitled Perception of Landscape, carried out during 1969 - 70, Sorte, in collaboration with Acking's project group used the experience so far gained, of the semantic method (Acking, Sorte 1969:2, 1970:1, 1970:2 and Sorte 1971). Sorte, who is a landscape architect, worked with what he terms complexity and unity in the landscape. These experiments have contributed to the elaboration of the method

in two ways. Partly, thanks to Acking-Sorte's choice of variables, two of our least well-defined factors have been given a clearer interpretation. This will be reported here. The result has also contributed to a deeper understanding of the meaning of two factors. This will be reported in the section on validity (3:3).

In principle, the experimental design was of type 1, i.e. a number of individuals judged several landscape environments in different variables. The environments were presented throughout as slides, in the manner described earlier. One difference however, was that only a few purposely selected variables were used, which limits the possible outcome of the factor analyses to a few factors. The question is then, not to find out the number of factors needed for a general description, but instead, whether a certain chosen variable comes out in the predicted factor. Another difference is that the data which formed the basis for a certain factor analysis in some cases were obtained from different test groups. This is, of course, only defensible if one can assume a high group stability. We will, later in this study, see that such an assumption may be valid. A third difference is that rating scales with one as well as two words were used (cf. 1:5). We have received the authors' permission to reproduce the 15 landscape pictures judged (see ILLUSTRATION 2).

In the first part of the study, concerning complexity in landscapes, two new semantic variables were used, namely, COMPOSITE AND COMPLEX as well as PRIMORDIAL AND NATURAL. In order to relate these with the pleasantness, enclosedness and complexity factors obtained earlier, the variables PLEASANT AND INVITING, LIGHT AND OPEN as well as MOTLEY AND UNTIDY, were also included. The factor matrix based on mean values from 43 students of architecture is given in TABLE 6.

We can first of all establish that the variables earlier used come out with high loadings in one factor each and low loadings in the other factors. Thus, the first factor is highly loaded with MOTLEY AND UNTIDY and can be interpreted as a complexity factor. The second factor is highly loaded with PLEASANT AND INVITING and is thus a pleasantness factor. The third factor is reasonably loaded with LIGHT AND OPEN and should by all accounts be an enclosedness factor. This could mean that the factor structure obtained earlier is also valid for describing landscape. The most interesting is, however, that the new variable COMPOSITE AND COMPLEX unambiguously comes out in the complexity factor. This has earlier been found loaded with MOTLEY, UNTIDY, UNRESTFUL, DISCREET, and been assumed to reflect the liveliness and complexity in the environment. We have been strengthened in our opinion that the factor does reflect the complexity of the environment. This means that the parallel to Osgood's activity factor can be drawn even sharper. The other new variable PRIMORDIAL AND NATURAL is given no unambiguous position

The other part of the study took up the unity of the landscape. Thus, one proceeded from the factor which we have interpreted

TABLE 6. Factor matrix according to Acking, Sorte 1969:2

	I	II	III
COMPOSITE AND COMPLEX	.95	.11	-.28
PLEASANT AND INVITING	-.03	-.83	-.23
LIGHT AND OPEN	-.27	.14	.55
MOTLEY AND UNTIDY	.91	.23	-.35
PRIMORDIAL AND NATURAL	-.57	-.76	.10
Proportion of total variance in %	55	23	2

TABLE 7. Factor matrix according to Acking, Sorte 1970:1

	I	II	III	IV	V	VI
COMPOSITE AND COMPLEX	.03	.98	-.17	.10	-.02	.01
PLEASANT AND INVITING	.97	-.10	-.15	-.02	-.05	.07
LIGHT AND OPEN	-.14	-.24	.86	-.04	.00	.00
MOTLEY AND UNTIDY	-.06	.97	-.20	.09	.05	-.04
PRIMORDIAL AND NATURAL	.58	-.68	.02	-.20	-.34	.02
WHOLE	.58	-.57	.17	-.52	-.13	.00
UNITARY	.43	-.70	.13	-.53	-.05	.08
WELL THOUGHT-OUT	.73	-.44	-.08	-.49	.03	-.03
RHYTHMICAL	.84	-.26	.04	-.42	-.08	.00
DISPERSED	-.41	.76	-.07	.45	-.07	.18
IMAGINATIVE	.97	.03	-.11	-.13	.03	-.09
Proportion of total variance in %	65	23	5	3	1	-

as a unity factor because of the variables OF PURE STYLE and BADLY THOUGHT-OUT. This factor reflects the degree of unity and balance in the interior (2:1). In order to directly anchor the results to this factor the variable WELL THOUGHT-OUT was chosen. From an intuitive notion of the meaning of the factor and with regard to the special problems of landscape WHOLE, UNITARY, DISPERSED and RHYTHMICAL were also chosen. From pleasantness they chose IMAGINATIVE. The landscape pictures presented earlier, were now judged by 40 high-school students, who, as a group, are close to the group of technology students used earlier. The results from this and the previous experiment were thereafter dealt with in a common factor analysis (see TABLE 7).

In spite of the landscapes having been judged in separate variables by two different groups the structure was relatively stable. The first, second and third factors are pleasantness (.97 PLEASANT AND INVITING, .97 IMAGINATIVE), complexity (.98 COMPOSITE AND COMPLEX, .97 MOTLEY AND UNTIDY) and enclosedness (.86 LIGHT AND OPEN). The fourth factor had the highest loadings in the following variables: -.52 WHOLE, -.53 UNITARY, -.49 WELL THOUGHT-OUT, -.42 RHYTHMICAL, .45 DISPERSED. The remaining loadings are low. It is evident that this factor can be interpreted as a dimension of unity and that WELL THOUGHT-OUT has come out as expected. This also supports our interpretation of a unity factor in earlier experiments. It should, however, be noted that all variables of unity also have high loadings in pleasantness and complexity. Thus, the variables are measures of all these three factors. The connection with pleasantness is positive and with complexity it is negative. Since the factors are uncorrelated according to the conditions, this may imply, either that the variables of unity used, are simply bad measures of the unity factor or that the factors are, in fact, related. In the latter case one could use oblique rotation, i.e. with correlated factors. Before such a step is taken, an attempt should however be made to find variables which better define the unity factor. In the fifth factor there is only one loading to take into account, namely -.34 PRIMORDIAL AND NATURAL. This could correspond to the factor earlier named affection, but this is evidently a loose supposition.

The result of Acking, Sorte thus indicates that the factor structure received earlier is valid for landscape. Due to the very limited selection of variables one can, however, not exclude the possibility that the landscape situation demands further dimensions apart from those we have earlier found for interiors, in order to provide an adequate description. No matter how the case is here, we have been supplied with several new variables, which have given information on complexity as well as unity.

In 1970, Gärling conducted a study of working environment according to design 2. Among other things he posed the following questions: "Are the factors shown by Acking, Küller, applicable for describing perception of working environment? Are the results obtained for a group of architecture students visiting this environment for the first time the same as they are for those who work there every day (factory workers)?"

Gärling, like Osgood, used bipolar scales, a total of 27. Out of these 11 were chosen from our earlier experiments and one from Aking, Sorte 1969:2, which makes a comparison relatively simple. Gärling's subjects consisted of two different groups: one consisting of 40 architecture students (27 males and 13 females) and another consisting of 30 male factory workers who had their main occupation in or were very familiar with the chosen environment. This was a factory shop, 100 m long, 20 m wide and 15 m high. The ratings were carried out by the group of students immediately after a visit to the shop and by the factory workers during a break. Gärling processed the data for each group separately and in both cases obtained five interpretable factors. These were for the architecture students, in turn:

Architecture students. Factor I (proportion of variance 26 %)

- .82 FUNCTIONS WELL - FUNCTIONS BADLY
- .80 ORGANIZED - UNORGANIZED
- .79 RATIONAL - UNRATIONAL
- .75 PRACTICAL - IMPRACTICAL
- .71 EFFECTIVE - INEFFECTIVE

Gärling calls this a practical evaluation factor. In our original experiments with interiors, the practical-functional aspect can be said to have been represented by the variables COMFORTABLE and BADLY THOUGHT-OUT. Both these came out in the pleasantness factor but BADLY THOUGHT-OUT also came out in the unity factor. There is a rather great similarity in the meaning of WELL THOUGHT-OUT on the one hand and Gärling's variables on the other hand. We would therefore assume that Gärling's practical evaluation factor and the unity factor received by us, are two different sides of one and the same dimension, describing the relation between different parts of an environment, how well the parts fit together, constitute a functional, rational, effective and practical or well thought-out unity, i.e. how well organized they are. It is also probable that certain of Gärling's functional variables are particularly relevant where working environment is concerned.

Architecture students. Factor II (proportion of variance 13 %)

- .87 ATTRACTIVE - REPULSIVE
- .81 PLEASANT - UNPLEASANT
- .80 FRIENDLY - UNFRIENDLY
- .77 POSITIVE - NEGATIVE
- .68 AGREEABLE - DISAGREEABLE
- .64 BEAUTIFUL - UGLY
- .62 GOOD - BAD

This factor, which Gärling terms aesthetic evaluation, exactly corresponds to our pleasantness factor and Osgood's evaluation. Pleasantness is the name that best corresponds to our interpretation of the factor.

Architecture students. Factor III (proportion of variance 11 %)

- .81 LAVISH - MEAGRE
- .65 ASSUMING - MODEST
- .53 HIGH STATUS - LOW STATUS
- .51 CLEAR - UNCLEAR
- .50 FINE - SIMPLE

Gärling interprets this factor as social evaluation. It corresponds to our social status factor. It is difficult to say why CLEAR - UNCLEAR come up with a negative loading. Gärling also used the variable EXPENSIVE - CHEAP, which did, however, obtain a low loading in this factor. Instead, this variable is found in factor V. This indicates some form of peculiarity in the subject variance, or that too few factors have been rotated. The latter is, however, not the case, according to the report.

Architecture students. Factor IV (proportion of variance 8 %)

- .97 AIRY - ENCUMBERED
- .66 OPEN - CLOSED
- .61 SPACIOUS - NARROW
- .61 EMPTY - FILLED
- .50 COMPREHENSIBLE - ABSTRUSE
- .48 LIGHT - DARK

Here Gärling uses the same name as we do, namely enclosedness factor. It can be noted that the space variables have guided the rotation here and obtained higher loadings than the light variable.

Architecture students. Factor V (proportion of variance 6 %)

- .70 UNCOMPLICATED - COMPLICATED
- .66 EXPENSIVE - CHEAP

From the earlier cited results of Acking, Sorte, the high loading in the variable UNCOMPLICATED - COMPLICATED may indicate that this is a complexity factor. Gärling interprets it as such. As we mentioned earlier, the factor structure seems somewhat diffuse.

The factors obtained for the worker group were as follows:

Workers. Factor I (proportion of variance 21 %)

- .86 ATTRACTIVE - REPULSIVE
- .77 PLEASANT - UNPLEASANT
- .76 POSITIVE - NEGATIVE
- .72 ASSUMING - MODEST
- .72 BEAUTIFUL - UGLY
- .67 OPEN - CLOSED
- .59 AGREEABLE - DISAGREEABLE
- .52 AIRY - ENCUMBERED
- .51 HIGH STATUS - LOW STATUS

This is a pleasantness factor. An interesting phenomenon can be observed here, which we have touched on earlier. The variables ASSUMING - MODEST, HIGH STATUS - LOW STATUS as well as OPEN - CLOSED and AIRY - ENCUMBERED come out with moderate loadings here. Thus, these variables which were pure status and enclosedness variables respectively for the architecture students have, by the workers, to a certain extent been seen as an expression of pleasantness. This is a typical example of what Osgood et al called "collapsing the semantic space about a dominant single dimension". As we remember, Osgood et al reported a

similar result for the group of artists who were to evaluate abstract paintings (see 1:3). The general rule seems to be that the more the subjects are involved in what is to be judged, the higher the number of variables to obtain high loadings in the pleasantness factor.

Workers. Factor II (proportion of variance 18 %)

- .90 RATIONAL - UNRATIONAL
- .81 PRACTICAL - IMPRACTICAL
- .76 LUCID - CONFUSED
- .69 FUNCTIONS WELL - FUNCTIONS BADLY
- .66 ORGANIZED - UNORGANIZED
- .59 EFFECTIVE - INEFFECTIVE
- .52 GOOD - BAD
- .50 SPACIOUS - NARROW

As in the former case we presume that this practical evaluation factor expresses the degree of organization in the environment, i.e. what we call unity. It is interesting that the variables GOOD - BAD and SPACIOUS - NARROW have a practical functional significance to the workers.

Workers. Factor III (proportion of variance 9 %)

- .84 EXPENSIVE - CHEAP
- .71 APPROPRIATE - INAPPROPRIATE
- .67 LAVISH - MEAGRE
- (.45 EFFECTIVE - INEFFECTIVE)
- (.43 HIGH STATUS - LOW STATUS)

This is a status factor, apparently tending towards the effective side.

Workers. Factor IV (proportion of variance 6 %)

- .78 EMPTY - FILLED
- .53 AIRY - ENCUMBERED
- (-.43 GOOD - BAD)
- (.40 LAVISH - MEAGRE)
- (-.40 SPACIOUS - NARROW)
- (-.38 OPEN - CLOSED)
- .35 LIGHT - DARK

The fourth factor is an enclosedness factor, but apparently there is, even here, a tendency towards the effective. The highest loaded variables EMPTY - FILLED and AIRY - ENCUMBERED are of a concrete practical nature.

Workers. Factor V (proportion of variance 6 %)

- .67 COMPREHENSIBLE - ABSTRUSE
- .63 UNCOMPLICATED - COMPLICATED

As in the former case this would seem to be a complexity factor.

One can philosophize on why the first factor for the group of architecture students, i.e. the largest proportion of variance, concerns variables of a unity and functional character, while

the first factor for the worker group is a pleasantness factor. The variance for pleasantness and unity-function respectively is for the students 13 % and 26 % respectively and for the workers 21 % and 18 % respectively. Such a great difference once more shows the importance of separating the casual visitor from the involved users. It is furthermore possible that the practise in analysing spatial structures, which results from the education in architecture, may have contributed to change the order of the factors.

2:5 JUDGEMENT OF 15 ENVIRONMENTS ACCORDING TO DESIGN 1 (MAIN EXPERIMENT 2)

The attempt to analyse a great number of variables describing environment has so far shown that these can be referred to a small number of main dimensions (factors). It is true that, through this some of the variance is lost, but in our opinion this is made up for by the advantage of working with a small number of well-known dimensions. We will, here, summarize the factor structures obtained in the various experiments (TABLE 8).

Proceeding from the results in main experiment 1, one can make the observation that the factors pleasantness, enclosedness and complexity have returned in all later experiments. Of the remaining factors, social status, originality and unity have come out in at least one design 2 experiment. Affection and potency are least well established. The sampling of environments as well as subjects is rather wide and there is good reason for assuming that the original factors, at least the major part of them, are generally valid for describing environment. There is, however, one serious objection. All the experiments have been largely carried out with the 78 variables selected for main experiment 1. Aking, Sorte have even deliberately attempted to improve on the structure which we first obtained. Gärling partly made use of our variables. When he introduced some new variables with a practical-functional content and considered himself having obtained a new factor, a practical evaluation factor, we simply explained that this was probably a unity dimension. What would have happened if the judgements had been carried out with completely different variables? Perhaps those factors which were then obtained would have been interpreted in completely different terms?

The objection is serious and partly justified, particularly as a popular criticism of factor analysis often amounts to that one must naturally always "get out" what has been "put in". It should, however, be stressed that this, unfortunately, is the case for all scientific measuring, since what is measured is a function of the measuring operation. The objection is, however, particularly close at hand where factor analysis is concerned, since this so obviously implies a sorting out of what is put into it.

TABLE 8. Factor structures in experiments so far accounted for. For each factor the proportion of the total variance is given for each experiment as well as the relative occurrence over experiments. The shaded cells show the cases where it has not been possible, through limited choice of variables, for the factor to come out.

	Design 1 15 interiors	Design 1 (Acking, Sorte) 15 landscapes A	Design 1 (Acking, Sorte) 15 landscapes B	Design 2 1 interior	Design 2 1 exterior	Design 2 (Gärling) 1 working environment A	Design 2 (Gärling) 1 working environment B	Relative occurrence
Pleasantness	47	23	65	18	28	13	21	1.00
Social status	18					11	9	.60
Enclosedness	16	2	5	6	5	8	6	1.00
Originality	5				8			.67
Complexity	4	55	23	8	7	6	6	1.00
Affection	3		1					.50
Unity	2		3			26	18	.67
Potency	1							.33
Total variance	97	81	96	31	48	64	61	

The aim is now to investigate whether the original selection of variables has had such a biasing effect. Therefore the earlier variables have largely been replaced by completely new ones. The environments have also been replaced. Instead of the 15 interior pictures, 15 pictures of very varying environments were now used, interiors as well as exteriors. The experimental group has been sampled from a much wider population than earlier. Altogether, this implies that the results may eventually be given a more generally valid interpretation.

Sampling of variables

Out of the original 78 variables, only a few were kept for each factor. Certain of Acking, Sorte's and Gärling's variables were also included. The approximately 1050 descriptive words used earlier, as a word bank, were again assorted, this time according to expected factor belonging. The assorting was carried out by three judges, which had several years' experience of the semantic method. Then three types of words were chosen, partly words which could be expected to come out in any of the earlier sparsely loaded factors, partly words which could give the established factors a wider or different meaning and finally words which did not seem to fit into any of the factors (TABLE 9).

Out of the 66 variables finally selected, 33 were completely new, while the remaining 33 had been used in at least some earlier experiment. As earlier the words had to be easily understood, generally occurring, of contextual interest and meaningfully applicable, in this case to environment in general.

Selection of environments

Two architects, of which one was an interior designer as well, one interior designer and one landscape architect made up a list each of environments, whereby they were to note as many different types as they could. Apart from a division into interior and exterior environments they were to choose their own way of grouping. Proceeding from these lists a great number of environments were then photographed from different angles. This was carried out by two photographers according to the following criteria:

- 1 Selection is not to be based on architectonic grounds. Instead the environments are to be typical of Swedish environment and shall as far as possible constitute a representative sample.
- 2 The picture is to show an environment either in its entirety or a considerable part of it.
- 3 The motives will constitute or contain man-made environments, i.e. some form of settlement or agricultural landscape.
- 4 The picture is to be authentic, i.e. not arranged for photography, it must depict the situation such as it was at the time e.g. as regards lighting, amount of people, arrangements and activities.
- 5 The photograph is to be taken from eye-level, with wide-angle 35 mm optics and show a horizontal section, which

TABLE 9. Choice of variables for main experiment 2. Words used in any of the earlier presented experiments (including Acking, Sorte and Gärling) are underlined. (Words 35, 39 and 42 are direct opposites to words used earlier. FUNCTIONAL corresponds to Gärling's FUNCTIONS WELL.) (Cf. APPENDIX H1.)

1	<u>MODEST</u>	34	NEW
2	DEMARCATED	35	<u>UNINTERESTING</u>
3	<u>CHEAP</u>	36	<u>UNCOMPLICATED</u>
4	<u>MOTLEY</u>	37	INGENUOUS
5	BRUTAL	38	<u>VARIED</u>
6	<u>EXPENSIVE</u>	39	<u>IMPERSONAL</u>
7	SUBDUED	40	<u>IMPRACTICAL</u>
8	<u>FEMININE</u>	41	<u>ORIGINAL</u>
9	UNFAMILIAR	42	<u>UNUSUAL</u>
10	<u>UGLY</u>	43	<u>PICTURESQUE</u>
11	<u>FUNCTIONAL</u>	44	<u>LAVISH</u>
12	DECAYED	45	<u>COMPOSITE</u>
13	DISTINGUISHED	46	COMPRESSED
14	DESTROYED	47	CONSONANT
15	<u>WHOLE</u>	48	SPECIAL
16	<u>IDYLIC</u>	49	SCATTERED
17	CLOSE	50	STABLE
18	COMPACT	51	<u>STERILE</u>
19	<u>COMPLEX</u>	52	<u>OF PURE STYLE</u>
20	CONSISTENT	53	BIG
21	ODD	54	<u>TIMELESS</u>
22	POTENT	55	TEMPORARY
23	WOMANLY	56	<u>PLEASANT</u>
24	<u>RURAL</u>	57	<u>PRIMORDIAL</u>
25	LIVELY	58	EXPRESSIVE
26	<u>LIGHT</u>	59	PERMANENT
27	<u>CALM</u>	60	WELL-SHAPED
28	CALMING	61	<u>FRIENDLY</u>
29	EASY	62	AGED
30	<u>COMPREHENSIBLE</u>	63	FRAGILE
31	MANLY	64	<u>OPEN</u>
32	<u>MASCULINE</u>	65	SURPRISING
33	MISANTHROPIC	66	<u>LUCID</u>

is the most natural to man.

- 6 In order to achieve technical uniformity Kodachrome X 19 din Daylight was used for daylight and Kodachrome High Speed Tungsten 22 din was used for artificial lighting.

Pictures with colour shades or otherwise of bad quality were weeded out. The material was supplemented with some already available pictures, which also met with the criteria. Finally there was a total of 76 pictures of good quality, showing completely different environments. They were assorted into two classes, interiors and exteriors, after which three judges selected about the same number of each class. The rule here was that the pictures should be as different as possible from each other. Finally one agreed on 8 exteriors and 7 interiors (see ILLUSTRATION 3).

The exteriors consisted of a fairly new housing development (A), a smallish church (C), a farm (F), some bungalows (G), a larger industry (J), a section of a landscape with forest and lake (K), a central city picture (L), and a new development with holiday homes (N). The interiors consisted of a station hall (B), an editing office of a newspaper (D), the interior of a home (E), a large supermarket (H), a hospital corridor (I), a cement factory (M), a restaurant (O). (The orders of presentation are given in APPENDIX D1.)

Experimental subjects

These were obtained by advertising in southern Swedish dailies and consisted of approximately the same number of men and women between ages 16 and 74 ($m = 33$, see APPENDIX D2). The ages 32-38 were not represented, probably because people of that age have less time to set aside for being experimental subjects. The occupations did vary considerably and the categories included were workers, public servants, businessmen, housewives, service personnel and old-age pensioners. In spite of the fact that advertising implies a certain selection, the group is probably representative of the population as a whole in the Malmö-Lund area, as regards judgement of environment. 64 people took part in the experiments but 5 reports were rejected and 3 discarded due to the fact that those persons had not been brought up in Sweden. This has been the criterion on linguistic understanding in the semantic experiments throughout. The final processing was thus carried out for 56 individuals.

Procedure

The experiment was conducted according to a completely balanced design. Procedure, place and other circumstances were identical with those prevailing in main experiment 1. One page from the record is shown in APPENDIX D3.

It may be of value to comment on the reactions of the subjects in the experiment. Earlier, we had not come across any difficulties in the actual carrying out of the experiments. It had happened that somebody asked for the meaning of a variable, and the standard answer was then; "We wish to know how you yourself interpret the word." Otherwise the instructions always seemed easy to understand and the scales were marked correctly. As

we were now using such a heterogeneous group, we did wonder how the whole thing would work out. It is most strenuous to judge 15 pictures approximately 70 times, i.e. some 1000 ratings. In spite of two breaks with coffee and buns, the whole thing became rather tiring. We did, however, find the motivation in this group as high as in the earlier used group of high-school students. The high tempo, one picture in approximately 8 seconds, could, surprisingly enough be followed by everyone. In one group we found 3 individuals who quickly learnt the pictures by heart, and judged in advance so that they were ready after only two hours instead of three. They were not included in the processing, but a scrutiny of their ratings gives a reliable impression.

Another observation which we made earlier, was that persons with certain types of visual defects had difficulties in refocussing from their records to the projected picture. This is probably why some persons reported headaches at the termination of the experiment. One of the older solved this problem by annotating what the slides depicted and then, instead judged from his notes. This case was also rejected from the processing.

It has earlier been mentioned that approximately 10 % of the persons to some extent made use of only 3 scale positions, position 1, 4 and 7. These were included in the processing. In only one case did we observe that a person had rated one of the variables at random. This was excluded from the processing. On the other hand, there were some cases where a variable had been ticked in the same position throughout. The subjects explained that they did not consider the pictures to vary in that variable. It does seem reasonable to process such judgements as well, and this was in fact done. It also turned out that words which started with the negations un- or im- e.g. IMPERSONAL, could give rise to a certain irritation.

IMPERSONAL

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

Here, one professed to prefer the variable PERSONAL. In a future report we will comment on the number of corrections made by the subjects while rating. Finally it must be mentioned that one person completely misunderstood the instruction.

Results

The processing was carried out in the manner described earlier, for design 1. The structure, which is most stable, is presented in the form of a factor matrix, with all loadings $\geq .30$ written out, and is commented in the text in the same way as earlier (TABLE 10).

As is shown by the matrix, 8 main dimensions were obtained, i.e. factors with high loadings in several variables. These are in turn:

TABLE 10. Distribution of variables on different factors in main experiment 2. All loadings $\geq .30$ have been included.

	I	II	III	IV	V	VI	VII	VIII	IX	X
1 MODEST	-.50	-.58						-.50		
2 DEMARCATED				.88						
3 CHEAP	-.77							-.32		
4 MOTLEY		.34	-.32		-.84					
5 BRUTAL	-.90	-.36								
6 EXPENSIVE	.70	.45						.43		
7 SUBDUED	.34				.78					-.41
8 FEMININE	.41	.90								
9 UNFAMILIAR	-.91	-.32								
10 UGLY	-.94									
11 FUNCTIONAL			.95							
12 DECAYED		-.54	-.59							
13 DISTINGUISHED	.81	.37								
14 DESTROYED	-.88	-.30								
15 WHOLE	.49		.57		.58					
16 IDYLIC	.96									
17 CLOSE		.31		.47	-.67					
18 COMPACT	-.72				-.47			.35		
19 COMPLEX	-.83				-.51					
20 CONSISTENT			.76		.46					
21 ODD	-.89		-.32							
22 POTENT	.51	-.59					.30	.31		
23 WOMANLY	.30	.94								
24 RURAL	.73				.47					
25 LIVELY					-.92					

TABLE 10, cont'd

	I	II	III	IV	V	VI	VII	VIII	IX	X
26 LIGHT	.46				.48				.61	
27 CALM	.79				.56					
28 CALMING	.84				.48					
29 EASY	.89									
30 COMPREHENSIBLE	.79				.42					
31 MANLY		-.97								
32 MASCULINE		-.95								
33 MISANTHROPIC	-.93									
34 NEW	-.73						-.54			
35 UNINTERESTING	-.95									
36 UNCOMPLICATED	.81				.47					
37 INGENUOUS	.87				.37					
38 VARIED	.84				.37					
39 IMPERSONAL	-.95									
40 IMPRACTICAL	-.51		-.78							
41 ORIGINAL	.75					.48				
42 UNUSUAL		-.41				.70				
43 PICTURESQUE	.96									
44 LAVISH		.60		.52				.51		
45 COMPOSITE	-.31		-.32		-.66			.42		
46 COMPRESSED	-.77				-.46					
47 CONSONANT	.71		.48		.38					
48 SPECIAL		-.34	.30			.64	.49			
49 SCATTERED	-.36			-.79						
50 STABLE	.75				.51					
51 STERILE	-.94									
52 OF PURE STYLE	.52		.50		.59					

	I	II	III	IV	V	VI	VII	VIII	IX	X
53 BIG				-.85	.34					
54 TIMELESS	.85				.36		.30			
55 TEMPORARY	-.61				-.47		-.36	-.42		
56 PLEASANT	.95									
57 PRIMORDIAL	.89									
58 EXPRESSIVE	.84					.41				
59 PERMANENT	.68		.35		.43			.32		
60 WELL-SHAPED	.84		.32							
61 FRIENDLY	.92	.30								
62 AGED	.69						.60			
63 FRAGILE	.58	.63								
64 OPEN	.76			-.46	.40					
65 SURPRISING	.31				-.36	.85				
66 LUCID	.40			-.44	.73					
Proportion of total variance in %	56	13	11	7	4	3	2	1	1	1

Factor I

+		-	
.96	IDYLLIC	.95	<u>UNINTERESTING</u>
.96	PICTURESQUE	.95	<u>IMPERSONAL</u>
.95	<u>PLEASANT</u>	.94	<u>UGLY</u>
.92	<u>FRIENDLY</u>	.94	STERILE
.89	EASY	.93	MISANTHROPIC
.89	PRIMORDIAL	.91	UNFAMILIAR
.87	INGENUOUS	.90	BRUTAL
.85	TIMELESS	.89	ODD
.84	CALMING	.88	DESTROYED
.84	VARIED	.83	COMPLEX
.84	EXPRESSIVE	.77	CHEAP
.84	WELL-SHAPED	.77	COMPRESSED
.81	DISTINGUISHED	.73	NEW
.81	UNCOMPLICATED	.72	COMPACT
.79	CALM	.61	TEMPORARY
.79	COMPREHENSIBLE		
.76	OPEN		
.75	ORIGINAL		
.75	STABLE		
.73	RURAL		
.71	CONSONANT		
.70	EXPENSIVE		
.69	AGED		
.68	PERMANENT		

This first factor is a completely unambiguous pleasantness factor. Those variables which have earlier come out with high loadings in the factor are underlined. They have obtained very high loadings here. It will be noted that PICTURESQUE, which, in main experiment 1, had a high loading in the affection factor, has now floated over to the pleasantness factor. This variable is apparently sporadic.

Factor II

+		-	
.94	WOMANLY	.97	MANLY
.90	<u>FEMININE</u>	.95	<u>MASCULINE</u>
.63	FRAGILE	.59	POTENT
.60	LAVISH	.58	MODEST
		(.54	DECAYED)

The second factor is potency. It has come to be much better defined than earlier both with regard to the sex variables and the pure potency variables POTENT - FRAGILE. It is interesting that this factor comes as high up as second place. The reason can probably be found in the selection of environments. The difference is certainly great between the potent industrial environments (ILLUSTRATION 3, pictures J and M) and the more feminine interiors (pictures E and O).

Factor III

+	-
.95 <u>FUNCTIONAL</u>	.78 <u>IMPRACTICAL</u>
.76 <u>CONSISTENT</u>	.59 <u>DECAYED</u>
(.57 <u>WHOLE</u>)	
(.50 <u>OF PURE STYLE</u>)	
(.48 <u>CONSONANT</u>)	

The third factor is a unity factor. It has gained considerably in clarity, by the fact that also the practical-functional aspect has been included. The hypothesis formulated from the results of Gärting, that the functional evaluation factor and our unity factor were aspects of the same dimension seems to have been confirmed. The terminology can still be discussed, but in our opinion the variable CONSISTENT is so far the one which best expresses the well-balanced relation between the various parts of the unity, which we have read into this factor. A functional environment is also usually an environment where the various components have well-balanced relations. These problems will be returned to in the section on validity.

Factor IV

+	-
.88 <u>DEMARCATED</u>	.85 <u>BIG</u>
(.52 <u>LAVISH</u>)	.79 <u>SCATTERED</u>
(.47 <u>CLOSE</u>)	(.46 <u>OPEN</u>)
	(.44 <u>LUCID</u>)

The enclosedness factor has throughout come out in the third or fourth position. Here, it is best defined by DEMARCATED, which of course, is applicable to both rooms and buildings. Perhaps BIG, on the other hand, is of less interest. This variable is so obviously connected with the physical, tape-measured surrounding, that it becomes uninteresting. Through its rather unambiguous connection with environment it may perhaps therefore guide the rotation to an undesirable extent.

Factor V

+	-
.78 <u>SUBDUED</u>	.92 <u>LIVELY</u>
.73 <u>LUCID</u>	.84 <u>MOTLEY</u>
.59 <u>OF PURE STYLE</u>	.67 <u>CLOSE</u>
.58 <u>WHOLE</u>	.66 <u>COMPOSITE</u>
(.56 <u>CALM</u>)	(.51 <u>COMPLEX</u>)
(.51 <u>STABLE</u>)	(.47 <u>COMPACT</u>)
(.48 <u>LIGHT</u>)	(.47 <u>TEMPORARY</u>)
(.48 <u>CALMING</u>)	(.46 <u>COMPRESSED</u>)
(.47 <u>RURAL</u>)	
(.47 <u>UNCOMPLICATED</u>)	
(.46 <u>CONSISTENT</u>)	
(.43 <u>PERMANENT</u>)	
(.42 <u>COMPREHENSIBLE</u>)	
(.40 <u>OPEN</u>)	

Thanks to the variable MOTLEY it is now clear that this is a complexity factor. We then also find that Acking, Sorte's variable COMPOSITE AND COMPLEX, here divided into two variables, comes out as expected. Also Gärling's UNCOMPLICATED belongs, as we assumed earlier, to this dimension. The completely new variable LIVELY seems to cover our interpretation of the factor.

Factor VI

+	-
.85 SURPRISING	
.70 <u>UNUSUAL</u>	
.64 SPECIAL	
(.48 <u>ORIGINAL</u>)	

The originality factor, so far obtained in two experiments, thus returns. It has a certain likeness to one of Osgood's least well defined factors, namely novelty. There is, however, no cause to force such a parallel here.

Factor VII

+	-
(.60 AGED)	(.54 NEW)
(.49 SPECIAL)	(.36 TEMPORARY)
(.30 <u>TIMELESS</u>)	

In the first main experiment we obtained a factor which seemed to describe a feeling for the old, the rural, the genuine. It was highly loaded in PICTURESQUE and RURAL as well as reasonably loaded in TIMELESS and on the other side MODERN. Both PICTURESQUE and RURAL have floated to the pleasantness factor. On the other hand, AGED and TIMELESS could be expressions of such an affection as well as NEW and TEMPORARY of its contrary. Therefore, we keep the name affection factor for this dimension. Only further experiments can show whether this is well-founded.

Factor VIII

+	-
(.51 <u>LAVISH</u>)	(.50 MODEST)
(.43 <u>EXPENSIVE</u>)	(.42 TEMPORARY)
(.42 COMPOSITE)	(.32 CHEAP)
(.35 COMPACT)	
(.32 PERMANENT)	

The last meaningful factor is an obvious status dimension. All variables have apparently obtained higher loadings in other factors and the remaining variance is quite small.

The remainder of the rotated factors only contain singular variables. In factor IX, .61 LIGHT has fallen out. It is remarkable that the enclosedness dimension has not obtained any loading for this variable. One possible explanation is that lightness is a more important aspect of enclosedness in interiors than in exteriors, where the enclosedness varies irrespective of the strength of daylight.

Discussion

The 8 factors obtained in main experiment 1 have all come out. Except for potency, all of them have appeared in other experiments as well. With the exception of affection it has been possible to identify them satisfactorily. Since this has occurred in spite of half the variables being completely new, we dare suppose that the dimensions obtained are valid for describing various types of environment in a general and simple way. By alternately using designs 1 and 2, we also assume to know that the dimensions are suitable both for describing average differences between environments and the variation between individuals when judging a definite environment. There are probably environments which vary in a fewer number of dimensions and there are probably specialized subjects, e.g. architects, who vary in a greater number of dimensions. Those which have appeared do, however, seem meaningful through their universality and communicability. The actual test of meaningfulness is, however, the significance of the dimensions to future research. Will they lead to fruitful experiments and theories?

3 STUDY OF SPECIAL ASPECTS

3:1 GROUP STABILITY

Since the three first experiments had given fairly uniform results we then began to use the scales in applied connections. As an example can be mentioned colour studies (Acking, Küller 1968:5 and 1969:1), landscape studies (Acking, Sorte 1969:2, 1970:1,2 Sorte 1971) as well as research around methods of presentation (Acking, Küller, 1968:2, Acking, Sorte 1972:2). Thus, one or several variables from different factors were used. It was then desirable to find out the stability of the different scales and thus the following experiments were conducted.

a Comparison between high-school students and architects in judgement of interiors

Problem

To what extent do the judgements of these two groups agree? Is the agreement equally high in different dimensions?

Method

In order to obtain an answer to this we showed the 15 interior slides earlier judged by 41 high-school students, to 27 architects, who had, on an average, worked in the field of architecture for 11 years (cf. ILLUSTRATION 1).

As measuring instrument we used a test consisting of one rating scale for each of the 8 factors according to main experiment 1. They are presented here in the order in which they appeared in the test.

Variable	Factor	Loading acc. to M 1
EXPENSIVE	Social status	.89
OF PURE STYLE	Unity	.78
PLEASANT	Pleasantness	.98
OPEN	Enclosedness	.97
PICTURESQUE	Affection	.89
MOTLEY	Complexity	.87
MASCULINE	Potency	.50
ORDINARY	Originality	.82

The experimental situation was also simplified, to the extent that pictures and variables only appeared in one order each. All pictures were first shown once. Then one at a time was shown and judged in all 8 variables, after which the next picture was shown etc, until all 15 pictures had been judged. (Note that this approach is somewhat different from design 1.)

Result

The mean values for the pictures were calculated for each of the 8 variables. They are shown in FIGURES 1-8, where the corresponding mean values for the group of high-school students are also drawn. A correlation between the two groups is given for each variable.

----- Architects (N = 27)

———— High-school students (N = 41)

Status

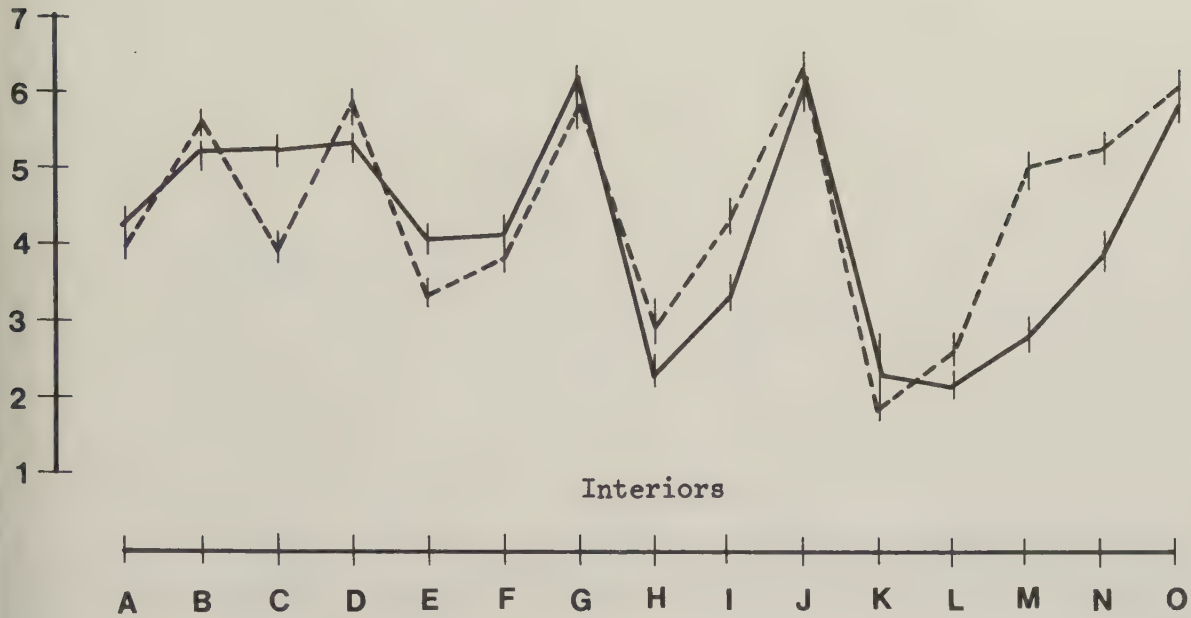


FIGURE 1. Social status for 15 interiors judged by high-school students and architects respectively, in the variable EXPENSIVE. Group stability: $r = .81$, $p < .01$.

----- Architects (N = 27)

———— High-school students (N = 41)

Unity

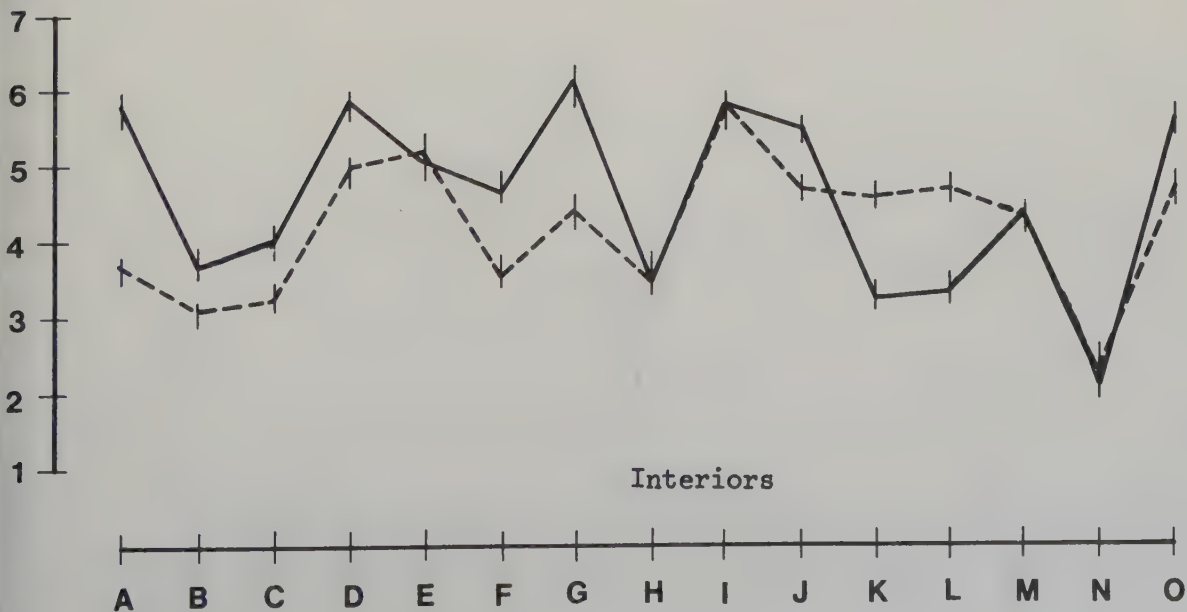


FIGURE 2. Unity for 15 interiors judged by high-school students and architects respectively, in the variable OF PURE STYLE. Group stability: $r = .63$, $p \approx .02$.

----- Architects (N = 27)

———— High-school students (N = 41)

Pleasantness

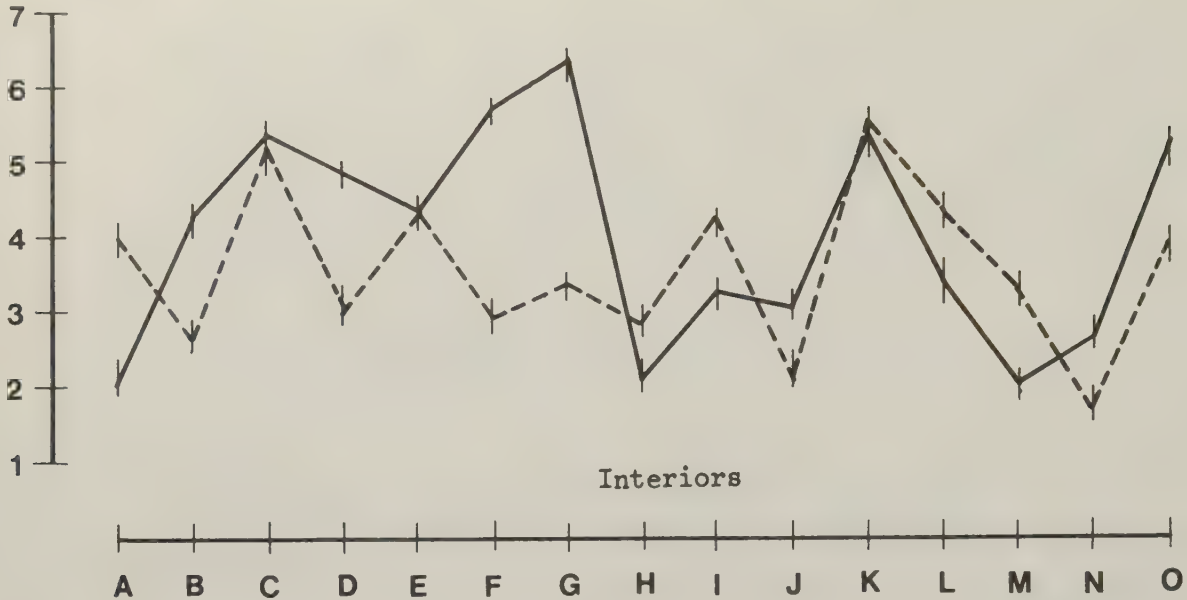


FIGURE 3. Pleasantness for 15 interiors judged by high-school students and architects respectively, in the variable PLEASANT. Group stability: $r = .34$, not significant.

----- Architects (N = 27)

———— High-school students (N = 41)

Enclosedness

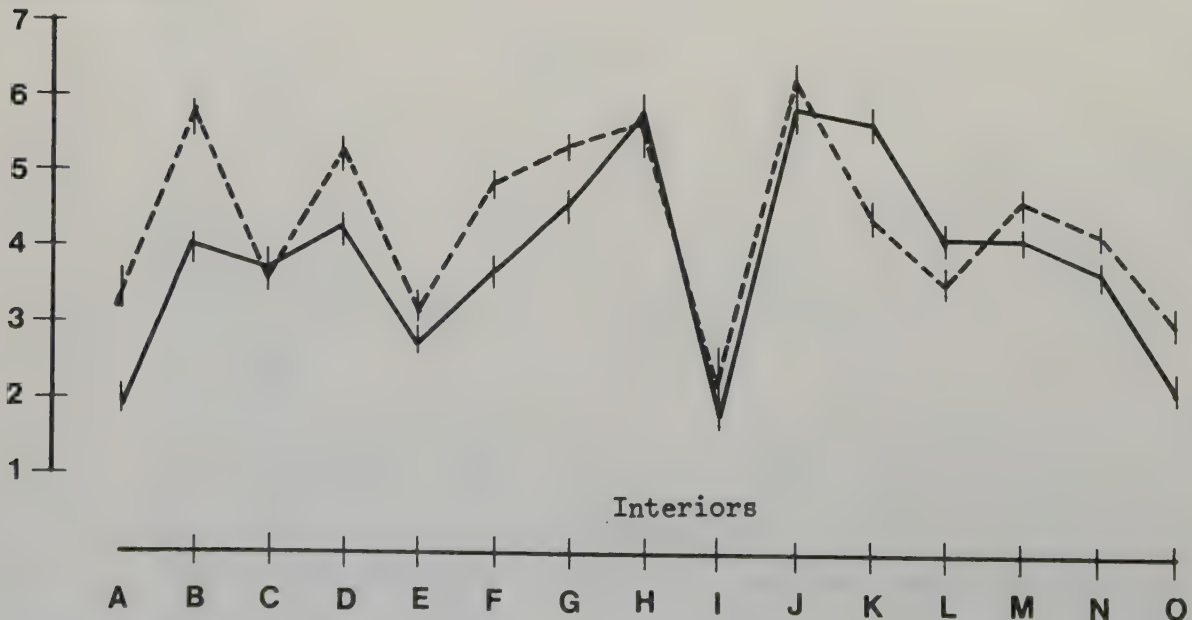


FIGURE 4. Enclosedness for 15 interiors judged by high-school students and architects respectively, in the variable OPEN. (Note that high enclosedness equals low openness.) Group stability: $r = .81$, $p < .01$.

----- Architects (N = 27)

77

—— High-school students (N = 41)

Affection

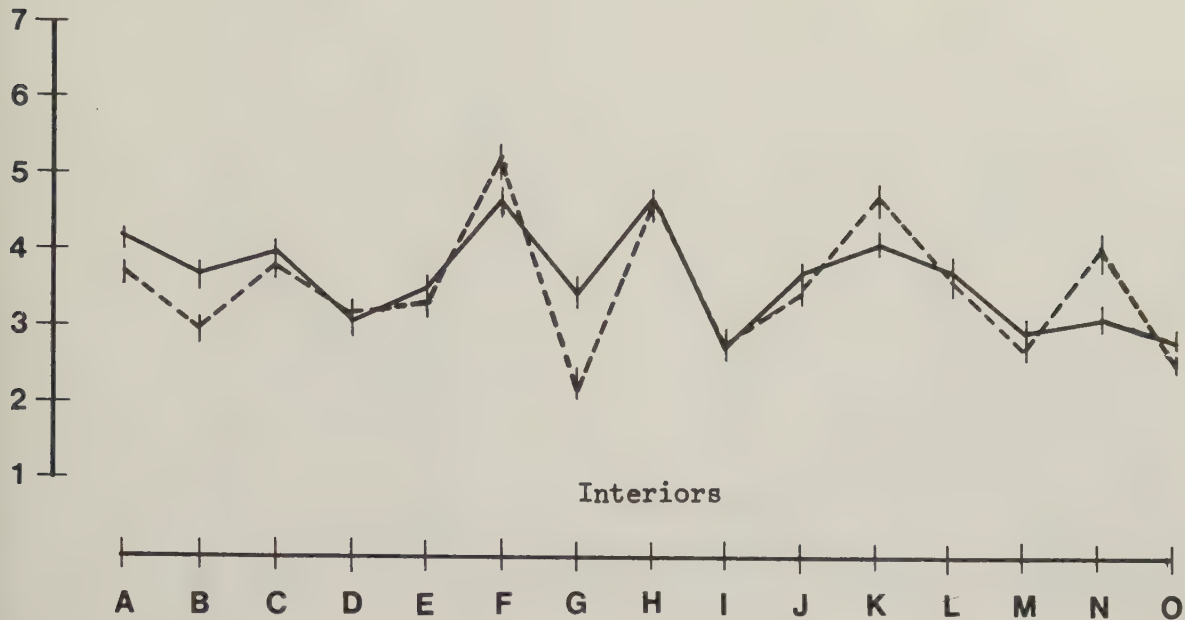


FIGURE 5. Affection for 15 interiors judged by high-school students and architects respectively, in the variable PICTURESQUE. Group stability: $r = .78$, $p < .01$.

----- Architects (N = 27)

—— High-school students (N = 41)

Complexity

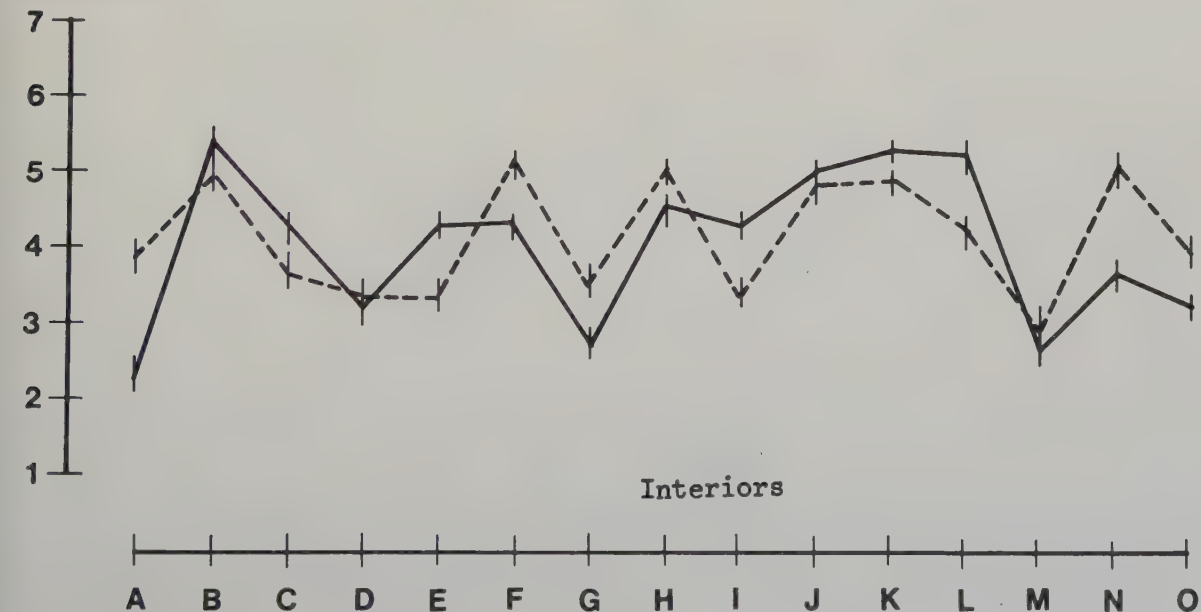


FIGURE 6. Complexity for 15 interiors judged by high-school students and architects respectively, in the variable MOTLEY. Group stability: $r = .59$, $p \approx .02$.

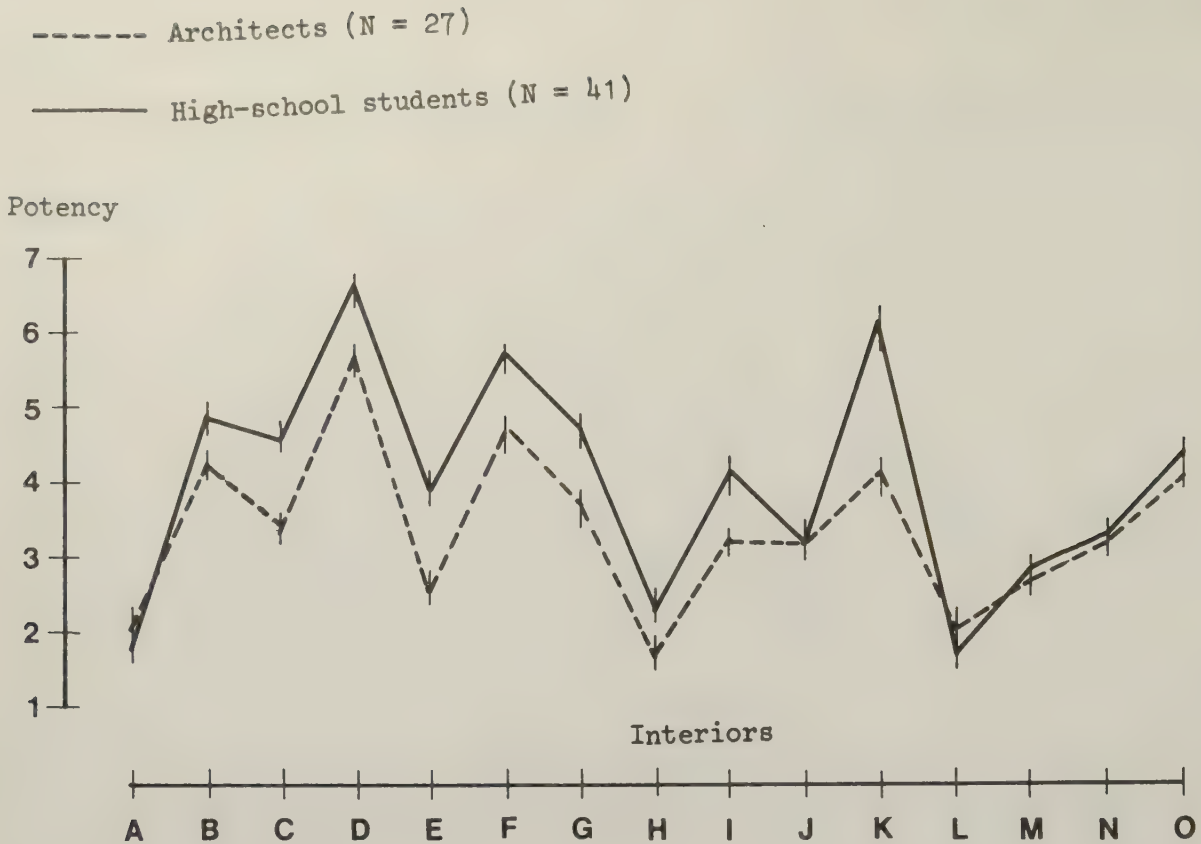


FIGURE 7. Potency for 15 interiors judged by high-school students and architects respectively, in the variable MASCULINE. Group stability: $r = .92$, $p < .01$.

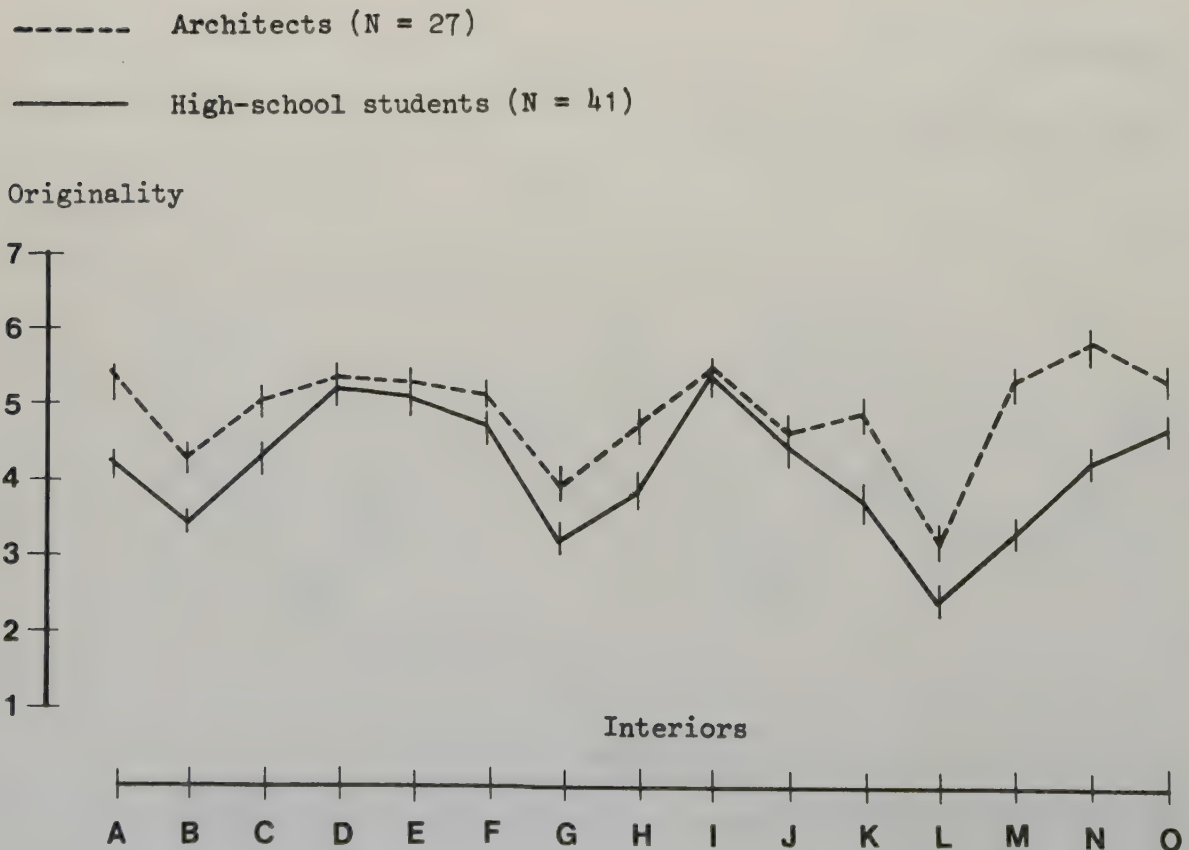


FIGURE 8. Originality for 15 interiors judged by high-school students and architects respectively, in the variable ORDINARY. Group stability: $r = .73$, $p < .01$. (ORDINARY implies low originality.)

Discussion

Due to the differences in the judgement situation, the correlations have probably come to be lower than they could have been. In spite of this, the two groups show great similarities. The correlations are high in four of the factors, enclosedness, potency, social status and affection. r is here between .78 and .92. That two groups of such different natures, in these factors obtain such similar results, indicates that the judgements are made from a well-established common frame of reference. Pleasantness shows the lowest correlation, $r = .34$, which is the only one that is not statistically ascertained. Thus the two groups differ most in their ratings here. The graphs for both groups show marked profiles, which indicates that there is great unity within each group respectively. The unity between the groups, however, is small. This may depend on two things. Either the pleasantness judgement is particularly sensitive to those differences in experimental design which prevailed, particularly, then, order of presentation. Another explanation is that the frame of reference in pleasantness judgement is much narrower than for the other factors, and that therefore different groups have their particular frames of reference. We will return to this problem. The correlations for complexity, unity and originality were fair. Therefore these factors could be assumed to take an intermediate position in regard to the above reasoning.

b Comparison between different types of architecture students from Denmark, Norway and Sweden as well as a group of Swedish housewives

Problem

Naturally the semantic method is dependent on linguistic understanding, which, among other things implies that the association of a variable with a particular factor may change in translation. Here the Scandinavian languages constitute a special case, since they contain so many words of a common origin as well as with similar form and meaning. We will cite a study made by Küller and Sorte, where 4 groups of architecture students from different Scandinavian countries are compared. In order to extend the comparison, we also include judgements by a group of housewives. All groups judged the pictures in the same order of presentation, which makes it possible to link in with the problems discussed in the previous experiment.

Method

The pictorial material consisted of nine landscape slides (these correspond to the earlier presented landscape pictures A, C, D, G, H, I, L, M, N, see ILLUSTRATION 2). These were shown in one order only, the same for all groups. The various experimental groups are described below.

Group No.	Number of exp. subj.	Line of study or occupation	Year	School
1	43	Architecture	First	The Lund Institute of Technology, Sweden
2	20	Interior design	Third	The State School of Arts, Craft and Design, Stockholm
3	18	Landscape architecture	First	The Agricultural University of Norway, Ås
4	18	Architecture	Mixed	The Royal Danish Academy of Fine Arts, Copenhagen
5	15	Housewives	-	The Lund region, Sweden

As indicated, all groups except the first consist of 15-20 individuals. Each group judged the slides in three or four of the following variables.

Variable	Factor	Judged by group
PLEASANT/INVITING	Pleasantness	1-5
MOTLEY/UNTIDY	Complexity	1-5
LIGHT/OPEN	Enclosedness	1-5
WHOLE	Unity	2-5

The experiments were conducted in such a way that when the instructions had been given, all pictures were first shown once. Then the first picture was shown, and was judged for all variables then picture No. 2 etc. until the last picture was shown. Group 1, 4 and 5 carried out the judgements in the same lecture hall and with the same technical equipment as described earlier. The conditions for presentation deviated for groups 2 and 3.

Result

The correlations between the different experimental groups are for each variable reported as product moment coefficients in TABLES 11-14 as well as graphically in FIGURES 9-12.

As can be seen, the correlations for pleasantness are average to high. None of the groups deviated markedly from the others. A scrutiny of the group graphs do show single deviations for some of the pictures. Concerning complexity, the correlations are also average to high. The graphs show a general tendency to increasing complexity from left to right. Group 1 shows a somewhat stronger increase than the rest. This may depend on the fact that the group is larger, and therefore the error variance has less effect. Note, also that the housewives (group 5) differ from the rest for picture N (see ILLUSTRATION 2). This picture shows a relatively recent and half-finished housing development and it is obvious that it has been considered to have a higher complexity, i.e. be more motley and untidy by the architect groups than by the housewives. Concerning enclosedness, the architect groups show high intercorrelations while the housewives deviate somewhat, particularly in pictures A, C and M. The correlations for unity are average. A couple of pictures, e.g. A, scatter the groups considerably.

- Group 5 Housewives, Sweden
 ——— Group 4 Architecture, Denmark
 — · — · — Group 3 Landscape architecture, Norway
 - - - - - Group 2 Interior design, Sweden
 — — — Group 1 Architecture, Sweden

Pleasantness

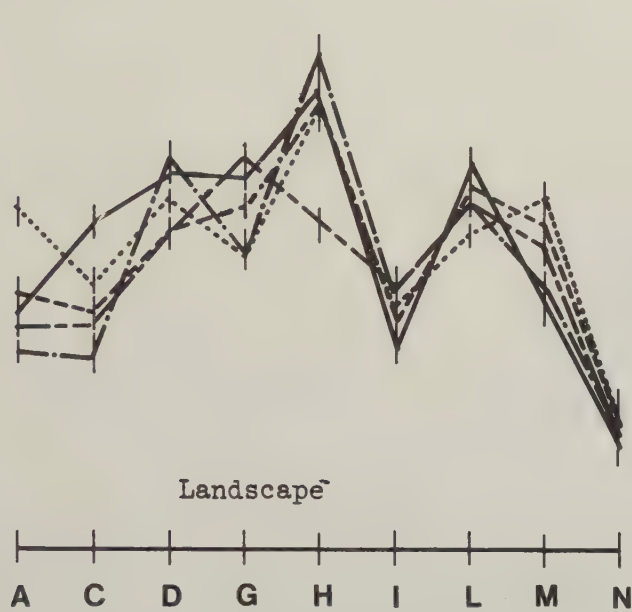


FIGURE 9. Pleasantness for 9 landscape slides judged by five different test groups, in the variable PLEASANT/INVITING.

Complexity

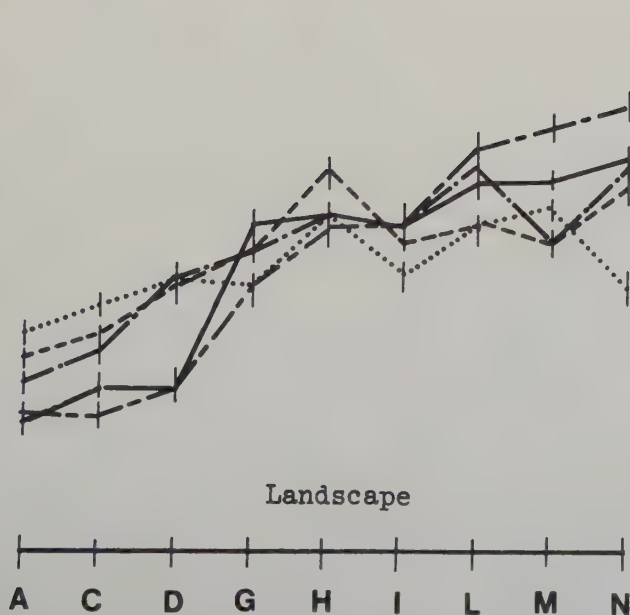


FIGURE 10. Complexity for 9 landscape slides judged by five different test groups, in the variable MOTLEY/UNTIDY. Symbols, see FIGURE 9.

- Group 5 Housewives, Sweden
- Group 4 Architecture, Denmark
- · — · — Group 3 Landscape architecture, Norway
- Group 2 Interior design, Sweden
- Group 1 Architecture, Sweden

Enclosedness

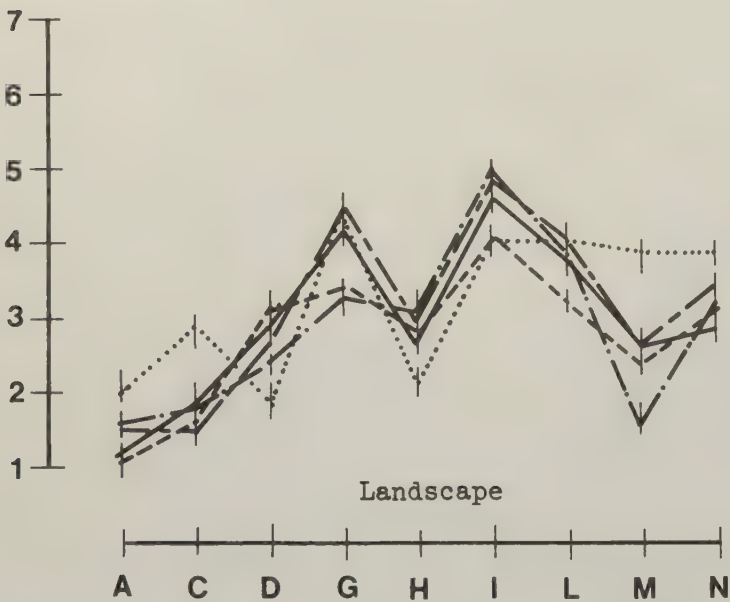


FIGURE 11. Enclosedness for 9 landscape slides judged by five different test groups, in the variable LIGHT/OPEN. (Note that high enclosedness equals low openness.)

Unity

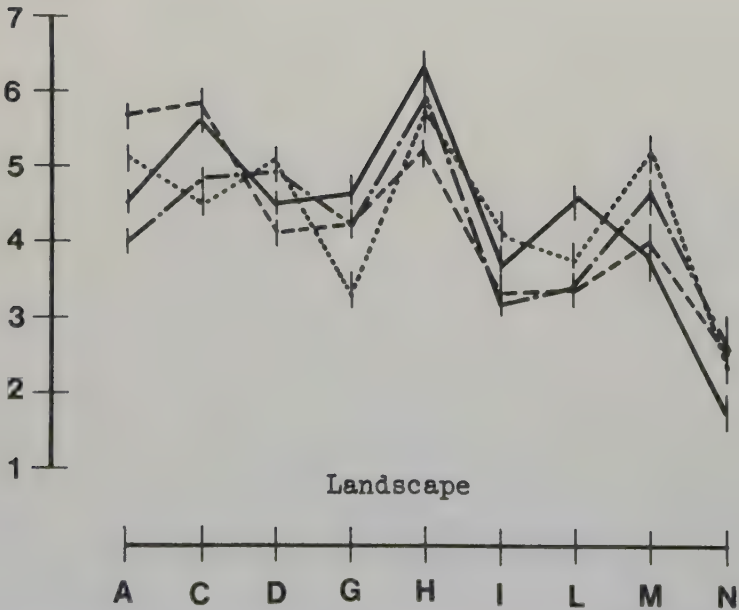


FIGURE 12. Unity for 9 landscape slides judged by four test groups, in the variable WHOLE. Symbols, see FIGURE 11, group 5 - group 2.

TABLE 11. Correlations between the different test groups for the variable PLEASANT/INVITING (pleasantness).

	1	2	3	4	5
Group 1 (architects, Sw)	-	.84	.74	.77	.64
Group 2 (interior designers, Sw)		-	.91	.95	.88
Group 3 (landscape architects, N)			-	.88	.82
Group 4 (architects, Denm)				-	.75
Group 5 (housewives, Sw)					-

$p = .10$ for $r = .58$

$p = .05$ for $r = .67$

$p = .02$ for $r = .75$

$p = .01$ for $r = .80$

TABLE 12. Correlations between the different test groups for the variable MOTLEY/UNTIDY (complexity).

	1	2	3	4	5
Group 1 (architects, Sw)	-	.84	.90	.95	.72
Group 2 (interior designers, Sw)		-	.91	.88	.74
Group 3 (landscape architects, N)			-	.90	.68
Group 4 (architects, Denm)				-	.71
Group 5 (housewives, Sw)					-

TABLE 13. Correlations between the different test groups for the variable LIGHT/OPEN (enclosedness).

	1	2	3	4	5
Group 1 (architects, Sw)	-	.94	.93	.96	.69
Group 2 (interior designers, Sw)		-	.86	.94	.55
Group 3 (landscape architects, N)			-	.92	.58
Group 4 (architects, Denm)				-	.68
Group 5 (housewives, Sw)					-

TABLE 14. Correlations between the different test groups for the variable WHOLE (unity).

	2	3	4	5
Group 2 (interior designers, Sw)	-	.73	.80	.70
Group 3 (landscape architects, N)		-	.84	.81
Group 4 (architects, Denm)			-	.65
Group 5 (housewives, Sw)				-

Discussion

Bearing in mind the small size of the groups and their various origins, education and aim, the stability must be considered good. From these preliminary results we venture to claim that the similarity between the different groups of architects is somewhat greater than between the group of Swedish architects and the housewives. Thus, the national barriers seem to have been overcome by the common aims of the architects. However, the housewives do not deviate markedly, as a group, which shows that even such a specialized aim as architecture does not to any greater extent affect the average judgement of environment. If this is seen in connection with the previous experiment, where experienced architects were compared with high-school students, one finds that the correlation there was considerably lower for pleasantness ($r = .34$) and complexity ($r = .59$) as well as unity ($r = .63$) while enclosedness showed quite a high correlation ($r = .81$). The two experiments are not quite comparable, but a tentative conclusion will be, that even if long-lasting work with design gives a somewhat deviating apprehension of environment, the lower correlations also depend partly on differences in the experimental approach.

When a number of pictures are judged, a frame of reference is built up during the experiment, and this may affect the judgement. Based on the present results, this influence can be assumed to be greatest when judging pleasantness. This problem will be discussed in the next section.

Summary

The group stability has proved to be average to high for groups of very varying kind. It is therefore reasonable that the semantic method could be standardized for different types of environment. It must, in any event, be seen as a useful research instrument within this current field, where stable measuring methods have so far been missing.

3:2 THE FRAME OF REFERENCE OF SEMANTIC JUDGEMENT

Questions

We have earlier described two basically different experimental manners of approach, in detail, which we have called design 1 and design 2. Apart from the difference in processing at hand, which has been commented upon earlier, these two designs also show another difference, at least as important. According to design 2, each subject rates only one environment. Thus, the ratings are made on the basis of an inner frame of reference, against which the person, so to speak, compares his impressions of the environment. According to design 1, the subject rates several different environments. Thus, a special frame of reference is built up during the experiment, where each environment is compared to the others. Each judgement (except for the first one) is influenced by the preceding (Helson 1964). On

condition that the experimental design is balanced (this implies, here, that the environments are presented in several different orders) the effect of the particular frame of reference is that the error variance is decreased. This makes the design more sensitive, i.e. the difference between the various environments is stressed, due to their being compared to one another.

A comparison between two groups will first be reported, where the individuals in the one group judged all environments in a balanced design. Out of the individuals in the other group, each one judged only one environment. Thus, these individuals had no opportunity to compare but had to rate exclusively from their inner frame of reference. We are interested in whether and in what dimensions there is a difference.

Method

In Stockholm, 9 underground stations were chosen at random and a semantic test was constructed. Double words were used as variables and these were formed as seven step semantic scales.

Variable	Factor
PLEASANT/INVITING	Pleasantness
MOTLEY/UNTIDY	Complexity
LIGHT/OPEN	Enclosedness
WHOLE/UNITARY	Unity
PRACTICAL/FUNCTIONAL	Unity

We had earlier found that the use of double words could be advantageous since the words would define each other and in this way strengthen each other's meaning. One condition is, of course, that the words in earlier factor analyses had proved to be included in the same factor and be highly correlated in a positive way.

The one experiment group consisted of 17 students from The State School of Arts, Craft and Design in Stockholm (third year in the department for furniture and interior design). Their ages varied between 21 and 39 with a mean value of 26.5 years. 10 were male and 7 female. They were randomly divided into three groups and after an instruction they, one by one, visited and rated the stations. Each group judged the stations in different orders. For each of the stations a mean value of the ratings in each variable was calculated.

The other group consisted of persons waiting at the different stations. In order to get the best possible distribution approximately 15 men and 15 women were selected at each station. They had the following age distribution: 5 each in the ages; 15-20, 20-30, 30-40, 40-50, 50-60 and above 60 years. The collected material shows that each station was rated by 29-35 persons. For each station the mean value of the ratings was calculated for each variable.

While each interior design student thus judged all stations, the subjects in the general group changed from station to station. The groups are, unfortunately, not equivalent. The interior

design students are more specialized than the general group with which they are compared. We do, however, have correlations from earlier, between a corresponding group of interior design students and a group of housewives, where the coefficients were, for pleasantness $r = .88$, for complexity $r = .74$, for enclosedness $r = .55$ and for unity $r = .70$. These correlations are reasonably high and should be able to serve as a departing point for the new comparison.

Result

In the processing, each variable was dealt with separately. Variance analyses were carried out for each group, to see whether the stations had been rated with any significant difference. (The result is summarized in TABLE 15. The variance analyses are found in APPENDIX E1.) The correlations between the groups were also calculated, and these are also found in the table. The average judgements are furthermore graphically presented in FIGURES 13-17.

PLEASANT/INVITING (Pleasantness)

The correlation between design students and the general group is non-existent ($r = .04$). Points of view vary considerably with people in general concerning these stations. The extreme ratings tend to cancel each other out and each station is on an average given a score of three. The design group, on the other hand, rates stations A, B and D higher than the rest, while G is given the lowest score. This differentiation is highly significant and points to the presence of a well developed common frame of reference for this group.

MOTLEY/UNTIDY (Complexity)

Here, too, the correlation is close to zero ($r = .08$). It is above all the low judgement given to station B by the design students together with the relatively small differences between the stations that decreases the coefficient. Apart from station B, the graphs follow each other quite well. It does, however, become apparent from the variance analysis, that the general group does not differentiate significantly between the stations. The low rating which the design students give station B can be assumed to be a result of their common education.

LIGHT/OPEN (Enclosedness)

The correlation between the two groups is very high ($r = .90$). The graphs follow each other well. Stations A, B and H were considered lightest and most open by the two groups, while station F was placed highest in enclosedness. The stations are well distributed over the entire scale and the variation between them is highly significant for both groups. The graphic picture indicates a somewhat greater variation for the design group.

WHOLE/UNITARY (Unity)

The correlation between the groups is rather high ($r = .68$), above all due to the fact that both groups place station B and I highest with regard to unity. The variation between the stations is significant in both cases. However, the stations seem to be rather similar in this dimension.

TABLE 15. Correlations between the two test groups for each estimated variable and summary of the variance analyses.

Variable	Factor	Significance level for variance between stations		Correlation	
		Interior designers	General group	r	P <
		P <	P <		
PLEASANT/ INVITING	Pleasantness	.0005	-	.04	-
MOTLEY/ UNTIDY	Complexity	.0005	-	.08	-
LIGHT/ OPEN	Enclosedness	.0005	.0005	.90	.01
WHOLE/ UNITARY	Unity	.001	≈.01	.68	.05
PRACTICAL/ FUNCTIONAL	Unity	.0005	.001	.62	.10

----- Interior design
———— General group

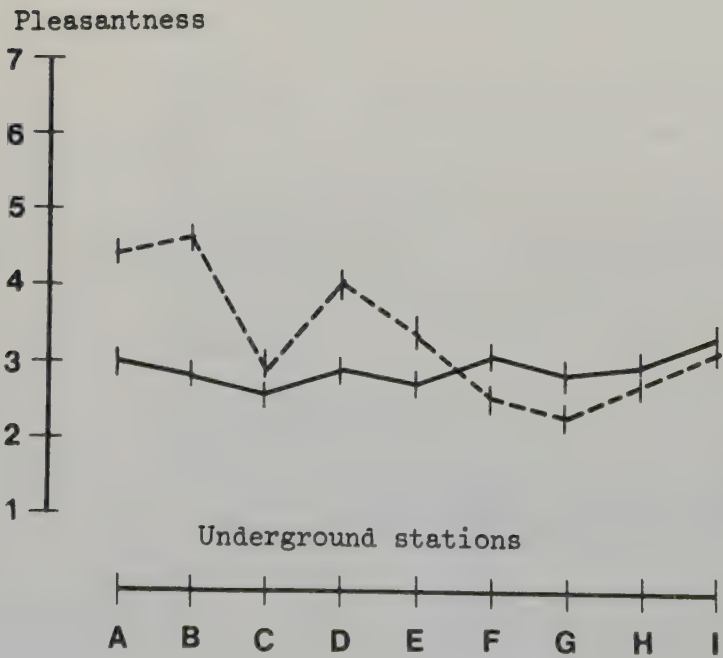


FIGURE 13. Pleasantness for 9 underground stations judged by two different groups in the variable PLEASANT/INVITING.

----- Interior design
—— General group

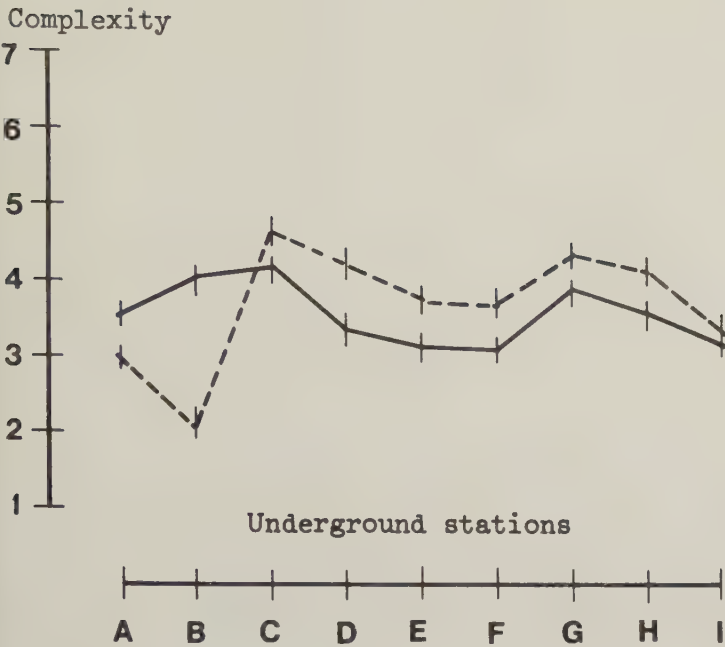


FIGURE 14. Complexity for 9 underground stations judged by two different groups, in the variable MOTLEY/UNTIDY.

----- Interior design
—— General group

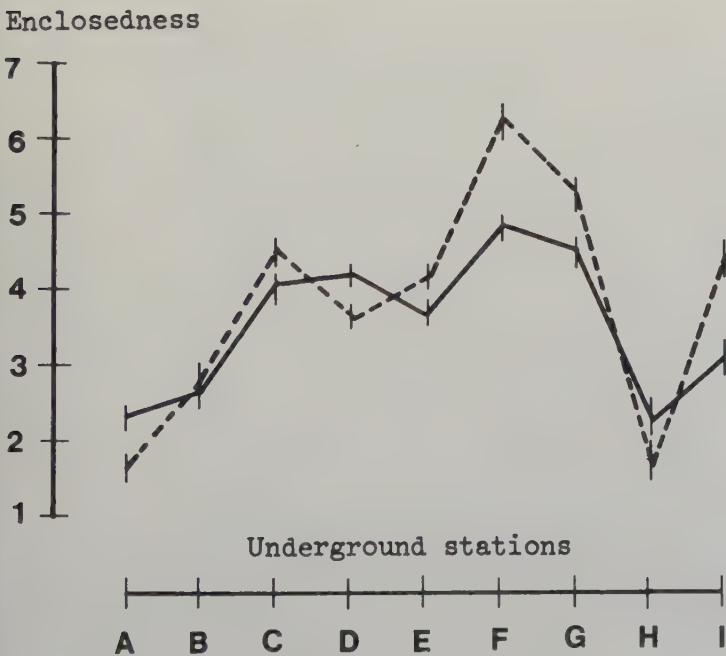


FIGURE 15. Enclosedness for 9 underground stations judged by two different groups, in the variable LIGHT/OPEN. (Note that high enclosedness equals low openness.)

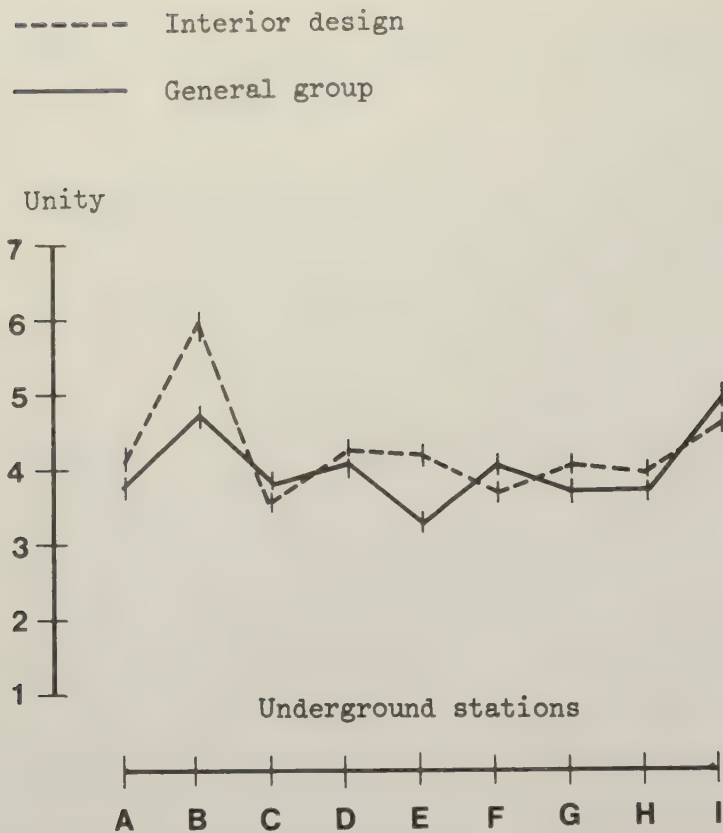


FIGURE 16. Unity for 9 underground stations judged by two different groups, in the variable WHOLE/UNITARY.

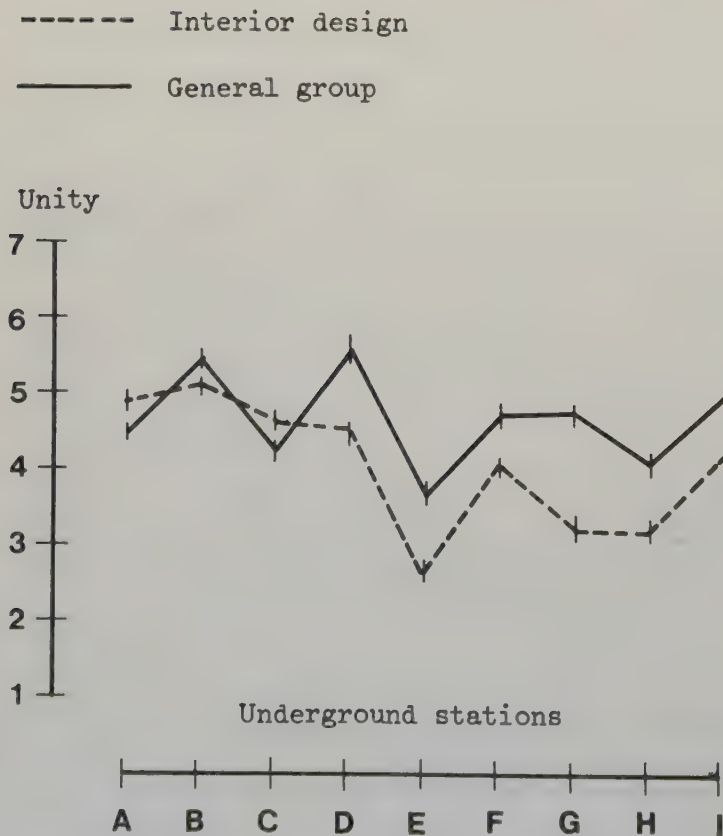


FIGURE 17. Unity for 9 underground stations judged by two different groups, in the variable PRACTICAL/FUNCTIONAL.

PRACTICAL/FUNCTIONAL (Unity)

The correlation is fair between the groups ($r = .62$). The graphs follow each other fairly well even if the variation is not particularly great. It is, however, significant in both cases. Station E is by both groups judged to be least functional. The idea the general group has of station D as most functional is not shared by the design group.

Discussion

The results can be interpreted in such a way that the design group has a somewhat more uniform attitude between them than people in general. The graphs show more marked profiles. In the enclosedness factor as well as the unity factor, the result for the design group does, however, agree well with the judgements of the general group.

Where pleasantness and complexity are concerned there is not, however, any connection between the design group and the general group. The reasons for this are probably two. First, the common frame of reference of the design students (education etc.) has probably made them more agreed and also sensitive to nuances. The general public as a group was more heterogeneous. The individuals have had such different experiences of the pleasantness and complexity of each station that the mean value has come to be somewhere in the middle.

The second and, perhaps, most important reason is the difference in experimental design between the groups. Each design student saw all stations and therefore had the opportunity of stabilizing his frame of reference. He could simply compare the stations; this has contributed to enlarging possible differences between these and also the graphic profile. In the general group different individuals judged each station. Thus each individual only had the opportunity of judging one station and hereby had only his built-in frame of reference to fall back on. This, naturally, increases the error variance for the general group.

Follow-up

The attempts to test group stability have so far shown that there is great agreement between different types of experimental groups, but also that the frame of reference which the experimental situation constitutes is significant. In the comparison between high-school students and architects (section 3:1a) a particularly low correlation for pleasantness was obtained between the groups. One reason could be factual differences between the groups, above all because of the high specialization of the architects. Another reason could be the differences in presentation approach which appeared. In a comparison between different types of architecture students from Denmark, Norway and Sweden as well as a group of housewives from Sweden (section 3:1b) all correlations were shown to be average to high. In these experiments the presentation approach was similar for all groups. Finally it became apparent that when a group of design students was compared with a general group, we obtained differences in pleasantness as well as in complexity. Apart from the fact that the general group was more heterogeneous, the difference

in presentation approach could be assumed to contribute to the differences mentioned.

Since the stability for the remaining factors, however, has been acceptable, the question comes up whether pleasantness and possibly complexity are less stable by nature. Perhaps judgements in these two dimensions are stable only when the experimental subjects can compare different environments directly, in a fixed order of presentation. This would imply that absolute rating of one single environment in pleasantness and complexity respectively would be fairly meaningless. In order to test this, the following experiment was conducted.

Method

Two rooms were selected, which were assumed, on subjective grounds, to differ markedly from each other in pleasantness as well as complexity. The one room was a large shelter, situated in a basement. It was empty apart from a ping-pong table, it was painted grey and lacked windows. The other room was a light, large studio with a sky-light. It was well-filled with modelling stands, chairs, tables, potters' benches and all sorts of art work and drawings.

50 visitors, students and teachers, from a college (people's high school) were divided into two groups with 25 in each group. They had no experience of semantic ratings. The rooms were judged in pleasantness (PLEASANT) and complexity (MOTLEY). One group first judged the shelter and then the studio, the order of presentation was reversed for the other group. This creates an opportunity to study the effect of order of presentation on the judgements. The following two questions were posed.

Are the groups able to differentiate between the rooms when these are judged as first rooms and there is, thus, only the inner frame of reference to turn to?

Will the differentiation be better when the rooms are judged as second rooms and can then be compared to those judged earlier?

Result

Pleasantness and complexity were treated separately through variance analysis (the variance analyses are found in APPENDIX E2).

Pleasantness

Order of presentation	Room		
	Studio	Shelter	
Studio before shelter	3.00	1.44	2.22
Shelter before studio	3.68	1.24	2.46
	3.34	1.34	2.34

As indicated by the matrix the average pleasantness for the shelter is 1.34 and for the studio 3.34. This is a difference of 2.00 units and highly significant. For those groups which judged these rooms first, the corresponding values are 1.24 and

3.00 respectively. The difference is 1.76 units. For the groups judging these rooms last, 1.44 and 3.68 units were obtained, i.e. a difference of 2.24 units. This tendency to interaction is not significant. Thus, the differentiation is the same irrespective of whether the rooms are judged first or second.

Complexity

Order of presentation	Room		
	Studio	Shelter	
Studio before shelter	3.52	1.80	2.66
Shelter before studio	3.48	1.40	2.44
	3.50	1.60	2.55

The average complexity is 1.60 for the shelter and 3.50 for the studio, a difference of 1.90 units, which is highly significant. When the rooms are judged first, the corresponding figures are 1.40 and 3.52 respectively, a difference of 2.12 units. When the rooms are judged second, the complexity is 1.80 and 3.48 respectively, a difference of 1.68 units. Nor is this interaction significant.

Discussion

Both the shelter and the studio obtained reliable and significantly different group averages in pleasantness and complexity. The order of presentation had no general effect on the judgements. Nor did the differentiation improve when the rooms were judged as second rooms and could then be compared with those judged earlier.

Summary

It has been ascertained that absolute ratings against an inner frame of reference can give reliable group values in all factors. We do not, however, wish to exclude the possibility of a frame of reference being built up, during the course of the experiment, which can strengthen possible differences particularly if these are small. In a direct comparison one can probably force the subjects to differentiate between very similar environments. If the subjects, furthermore, have similar aims, education and background, such a "pressed" differentiation may be facilitated. A future research task would be to compare the following four situations:

- Each individual is to judge: one environment in one variable
- one environment in several variables
- several environments in one variable
- several environments in several variables.

3:3 VALIDITY PROBLEMS

What do the various factors mean? Are they simply arbitrary descriptive dimensions or do they contain some deeper meaning? The last question is natural, but perhaps not correctly phrased. It could instead be expressed as follows: Can we, if we accept and use the dimensions obtained, tackle problems in the field of environmental psychology in a fruitful manner? Can we, with the aid of these dimensions help to build up a theoretical model with predictive power?

If the question is formulated in this way, one soon realizes that the factor analyses were a mere beginning and that the actual field of research is now, perhaps, within our reach. It is obvious that, in our interpretation of the factors, we work intuitively. But in some cases attempts have also been made to illuminate them with other methods. There may be cause here, for repeating the quotation from Anastasi: ... "construct validation requires the gradual accumulation of information from a variety of sources".

We will now attempt to supply our intuitive understanding of the factors, as well as reporting some validation experiments. Here, each factor will be presented separately and related to the pictorial material included in main experiments 1 and 2 as well as to Acking, Sorte's landscape slides. Each factor is introduced by a short description and a list of variables. In connection with this the pictures of interiors, landscapes and general environment, have been arranged according to their mean value in the respective factor (see ILLUSTRATIONS at back). Finally, validation experiments are commented upon for some of the factors.

Pleasantness

This dimension which, as a rule, answers for the greatest part of the variance, has been interpreted as a measure of the degree of pleasantness and security experienced by the individual in the environment. Those variables which came out with a high loading were, for the interiors, the following:

.98	<u>BORING</u>	.98	<u>STIMULATING</u>
.97	REPULSIVE	.98	<u>PLEASANT</u>
.95	<u>UGLY</u>	.97	<u>GOOD</u>
.95	NERVE-RACKING	.96	INVITING
.93	DEPRESSING	.95	HARMONIOUS
.90	FORMAL	.92	INTERESTING
.85	MONOTONOUS	.90	DYNAMIC
.85	HARD	.89	PERSONAL
.79	HUMBLE	.88	SOOTHING
.78	COLD	.87	TASTEFUL
		.87	<u>SECURE</u>
		.86	HEALTHY
		.86	RHYTHMICAL
		.83	COMFORTABLE

(cont'd)

.81	REPLETE WITH FEELING
.81	WARM
.80	COSY
.79	IMAGINATIVE
.78	SOFT
.78	FRAGRANT
.77	BEAUTIFUL
.75	MASCULINE
.74	CHEERFUL
.65	MODERN

Those variables which are underlined have been used to rank the pictures. The mean values of these variables have first been calculated, and then the pictures have been arranged according to increasing mean value. Note that the variables which are negative in relation to the dimension have been turned before calculating the mean value. By studying the pictures, where No. 1 represents lowest and No. 15 highest degree of pleasantness, one gets an idea of what the subjects have meant by pleasantness (ILLUSTRATION 4).

The variables which by Acking, Sorte were found to represent this factor for landscape pictures were (cf. ILLUSTRATION 5):

PLEASANT AND INVITING
IMAGINATIVE

For the general environments, high loadings were obtained in the following variables (cf. ILLUSTRATION 6):

.95	UNINTERESTING	.96	<u>IDYLIC</u>
.95	IMPERSONAL	.96	PICTURESQUE
.94	<u>UGLY</u>	.95	<u>PLEASANT</u>
.94	STERILE	.92	FRIENDLY
.93	MISANTHROPIC	.89	EASY
.91	UNFAMILIAR	.89	PRIMORDIAL
.90	<u>BRUTAL</u>	.87	INGENUOUS
.89	ODD	.85	TIMELESS
.88	DESTROYED	.84	CALMING
.83	COMPLEX	.84	VARIED
.77	CHEAP	.84	EXPRESSIVE
.77	COMPRESSED	.84	WELL-SHAPED
.73	NEW	.81	DISTINGUISHED
.72	COMPACT	.81	UNCOMPLICATED
.61	TEMPORARY	.79	CALM
		.79	COMPREHENSIVE
		.76	OPEN
		.75	ORIGINAL
		.75	STABLE
		.73	RURAL
		.71	CONSONANT
		.70	EXPENSIVE
		.69	AGED
		.68	PERMANENT

It is possible that pleasantness is the most important of all the environment factors. It does seem possible to arrive at this aspect with other methods of measurement, e.g. behavioural observation and physiological measurements, but we have not yet carried out any such experiments. In architectural theory there are suppositions as to what pleasantness actually depends on. Further on we will take up the possibility of regarding pleasantness as a function of some of the other dimensions.

Complexity

This dimension can be seen as a measure of the liveliness and complexity of the environment (cf. ILLUSTRATIONS 7-9). High loadings for the interiors were obtained in the following variables:

.84	<u>DISCREET</u>	.87	<u>MOTLEY</u>
(.58	QUIET)	.68	UNTIDY
		.65	UNRESTFUL

Variables for judging landscape:

COMPOSITE AND COMPLEX MOTLEY AND UNTIDY

Variables for judging general environment:

.78	<u>SUBDUED</u>	.92	<u>LIVELY</u>
.73	LUCID	.84	<u>MOTLEY</u>
.59	OF PURE STYLE	.67	CLOSE
.58	WHOLE	.66	<u>COMPOSITE</u>
(.56	CALM)	(.51	<u>COMPLEX</u>)
(.51	STABLE)	(.47	COMPACT)
(.48	LIGHT)	(.47	TEMPORARY)
(.48	CALMING)	(.46	COMPRESSED)
(.47	RURAL)		
(.47	UNCOMPLICATED)		
(.46	CONSISTENT)		
(.43	PERMANENT)		
(.42	COMPREHENSIBLE)		
(.40	OPEN)		

The complexity factor has been illuminated in two studies. In a series of experiments, where the colouring in an interior was systematically varied, Acking, Küller found a high correlation between chromatic strength and rated complexity ($r = .81$ $p < .01$), Acking, Küller 1969:1, see also Acking, Küller 1968:5).

In a study by Acking, Sorte, the subjects were asked to state the number of units they perceived in different landscape pictures. In the instruction, "unit" was defined as follows: A picture of a landscape can be divided into smaller units. A unit can either be a single "object" such as a tree, road, house, traffic sign, lamp post, meadow, field etc. or a "group" such as

group of trees, group of houses etc. Apart from these judgements, semantic ratings in the complexity factor were carried out. The variables used were: MOTLEY AND UNTIDY, COMPOSITE AND COMPLEX. In the processing, it became apparent that if number of units was expressed in a logarithmic scale, the correlation with average complexity would be completely linear with a very high correlation. $\log(\text{number of units}) - (\text{complexity gives } r = .97, p < .01.$

Thus, both chromatic strength and number of units as defined above, show high positive correlation with the complexity dimension (cf. also results under the unity factor).

Unity

This dimension has been interpreted as a measure of how well different parts of the environment fit together, or how well they function together (cf. ILLUSTRATIONS 10-12). The following variables came out with high loading for the interiors:

(.42 BADLY THOUGHT-OUT)	.78 <u>OF PURE STYLE</u>
-------------------------	--------------------------

Variables for judging landscape:

DISPERSED	<u>WHOLE</u>
	UNITARY
	WELL THOUGHT-OUT
	RHYTHMICAL

Variables for judging general environment:

.78 IMPRACTICAL	.95 <u>FUNCTIONAL</u>
.59 DECAYED	.76 <u>CONSISTENT</u>
	(.57 <u>WHOLE</u>)
	(.50 <u>OF PURE STYLE</u>)
	(.48 <u>CONSONANT</u>)

We will refer to an illuminating study by Acking, Sorte. In the course of trying to find some operation which would define this dimension unambiguously, the subjects were faced with the following task: The subjects had first rated the landscape pictures in semantic scales. They then judged whether there were any units which did not fit into the pictures. The following units were reported not to fit into at least one picture: Fields, silo, paths, barracks, bushes, hedges, two-storey houses, combine-harvesters, apartment houses, hills, wooden boxes, farms, road signs, letter boxes, advertisements, shadows, cranes, telegraph-poles, cars, trees, forests, mountains, stones, marks (spots), multi-storey buildings, garages, litter, flag-poles, sky, power-lines, annexes and colour on buildings, sheds, fencing, lawns, haystacks, thickets, clouds, lamps, roads.

From this result, the authors produced the following hypothesis:

"One has a feeling that some of the given units are of a more lasting character than others. One can imagine that units such as forests, hills and apartment houses, in the landscape environment are perceived to be more permanent than advertisements, haystacks and cranes. If this is the case, is it then of consequence to the perception, whether units which do not fit in are of permanent or temporary character. One could expect that it is more difficult to accept units of permanent character which do not fit in, than if they were of temporary character (the subject's possibility of affecting the situation)."

In order to test this hypothesis the given units were written on cards, one card for each unit. Then 10 subjects arranged them according to whether they could be thought permanently or temporarily placed in an environment. From this result, the units could be divided into two categories, permanent and temporary units. One then returned to the 15 landscape pictures and could, from the earlier judgements, for each picture calculate the number of units of permanent and temporary character, respectively which did not fit in. In this way, two measures were obtained for each picture:

Number of units of permanent character which do not fit in
 Number of units of temporary character which do not fit in

The correlation over pictures for these two measures was surprisingly low, $r = -.21$. This indicates that they are largely independent. The next step was to correlate both these measures with the semantic ratings for the pictures, after which the data was subjected to factor analysis (see TABLE 16).

As can be seen, PERMANENT UNITS WHICH DO NOT FIT IN came out in factor II, which is a unity factor, while TEMPORARY UNITS WHICH DO NOT FIT IN came out in the complexity factor.

The results of the study were summarized in the following way: "If the individual is confronted with an environment where he perceives units of permanent character not to fit in, this affects his feeling of unity. If one takes as a departing point units of temporary character which are perceived not to fit in then this seems more of a complexity phenomenon, i.e. it is more strongly linked with the individual's perception of there being many units in the situation. And furthermore one has an intuitive feeling that there is a possibility for the individual to change or not change a misplaced element which lies behind the difference in perception. An element which is misplaced and is of permanent character will then possibly be perceived in such a way that it must be there (difficult to change) and one will therefore judge it according to what connection it has with the other elements present. On the other hand, units which do not fit in and which are of temporary character, are actually not judged from their connection with other elements but seem only to be registered as existing." (See Acking, Sorte 1970:1 and Sorte 1971.)

Enclosedness

This dimension seems to describe the perception of the space and

TABLE 16. Factor matrix from Acking, Sorte 1970:1.

	I	II	III	IV
PERMANENT	.04	-.89	-.10	-.27
TEMPORARY	-.84	.26	.04	-.35
COMPOSITE/COMPLEX	-.77	-.21	.36	.01
PLEASANT/INVITING	.15	.28	.23	.74
LIGHT/OPEN	.18	-.07	-.71	-.11
WHOLE	.54	.49	-.27	.58
Proportion of total variance in %	40	24	11	3

lightness of an interior, the extent of a street or the demarcation and extent of a body (cf. ILLUSTRATIONS 13-15).

In this factor, the variables obtained for interiors were:

.97	<u>AIRY</u>	.96	<u>CLOSED</u>
.97	<u>OPEN</u>	.79	DARK
.79	SUNNY	.74	ENCUMBERED
.78	LIGHT	.71	HEAVY
.76	SPACIOUS		
.74	COOL		
.69	BLUE		

Variables for judging landscapes were LIGHT AND OPEN and for general environment:

.85	BIG	.88	<u>DEMARCATED</u>
.79	<u>SCATTERED</u>	(.52	<u>LAVISH)</u>
(.46	<u>OPEN)</u>	(.47	CLOSE)
(.44	LUCID)		

In a study by Küller (1971) the relation between openness, lightness and size of a room were, among other things, studied. The departing point was a hypothesis according to Ames (Kilpatric 1961) which implies that light surfaces seem either larger or closer than dark surfaces. Since all walls in a room cannot come closer to the onlooker with their size intact, then the whole room seems larger, instead. A study showed that there was a high positive correlation between rated openness and the lightness of the walls ($r = .76, p < .01$). This experiment had, however, been carried out with the aid of colour slides of drawings and was therefore repeated in full scale. Although the latter experiment, for practical reasons was limited to three rooms, it gave clear evidence of the earlier result. Since the variable OPEN is the negative pole in the enclosedness factor this implies that there is a strong negative correlation between lightness in limitation surfaces of a room and rated enclosedness.

Since the variable BIG came out in the enclosedness factor, it can also be of interest to cite an experiment from the same study, where the size of three rooms, 6, 12 and 24 m² respectively, was measured in three different ways and then compared. The following methods of measuring were used:

- 1 Physical size measured with a tape measure
- 2 Semantic size. A group of experimental subjects judged the size by putting marks on a line

very	_____	very
small		big

- 3 Judgement of length and width. The subjects were here asked to say how large they thought the room was.

Each subject judged one room only and the ratings were thus made against an inner frame of reference. The result for the semantic method was summarized in the following way: "As expected, the three rooms have been judged significantly different. This shows the existence of an inner frame of reference with which the individual can compare volumes of rooms in absolute ratings. The individual differences are, however, very great. The three rooms have also been rated significantly different in respect to length and width. Also here are the individual differences unexpectedly great. Both the semantic method and the ratings of length and width produced very similar results, as regards total-curves. The correlation with the physical volume is linear with insignificant deviations. This means that both methods of judgement give a euclidean description of rooms of this size. They do, however, give great error variance for the individuals. The same room (24 m²) has e.g. by one individual been rated as 3x5 m and 51 mm respectively and by another individual as 5x10 m and 48 mm respectively. This shows the danger of letting all too small groups or single individuals conduct judgement of size. The mean values seem to become reliable, however, in groups of 15-20 individuals."

Another question taken up in this connection was whether the individuals who had given a high semantic rating had also given great length and width etc. for the same room. The correlation between the rating methods was calculated as a product moment coefficient for each of the three rooms. All correlations became very low and did not significantly differ from zero. Thus, it seems as if the way in which an individual makes use of the semantic scale is independent of the way in which he indicates length and width for one and the same room. The interpretation of this result is very intricate. The most far-reaching conclusion would be that individual variations in perceived size are independent of variations in perceived length and width. The most probable conclusion is, however, that both rating methods give a random, and between them independent, deviation from the perception.

Potency

The interpretation of this dimension bases itself above all on the existence of the variables MASCULINE, POTENT, as opposed to FEMININE, FRAGILE. Thus, it is partly a question of intrinsic, potential potency in the environment, which is indicated by the picture where an industry is blasted into the surrounding mountain (see ILLUSTRATION 17). In other environments it is rather the sex aspect which dominates and leads to the environments being associated with one sex or the other. An example is the drawing-room in the same illustration, which is full of flowers and paintings and where there is also a lady present.

The link between the manly and potent, on the one hand, and the womanly and fragile on the other is apparently very deeply rooted in the subjects. We have noticed a certain reluctance in some female subjects to rate in the scales MASCULINE and FEMININE. They have maintained that there is no such aspect. Even a female experimental leader, who in other circumstances used the seman-

tic scales, refused to use these sex scales. She pointed out that they could have a sex-discriminatory effect. It is probable that this reluctance is connected with the debate on the role of the sexes. In any event, one can note that this potency dimension is sometimes responsible for a large part of the variance. So far it has only appeared in experiments according to design 1 (see ILLUSTRATIONS 16-17).

The variables which in the interior experiment, came out highest in this factor were

(.55 FEMININE)

(.50 MASCULINE)

From, and including this factor, the landscapes are not represented, since they have only been judged in a few variables which have come out mainly in the earlier factors.

The following variables came out for the general environment.

.94 WOMANLY
.90 FEMININE
.63 FRAGILE
.60 LAVISH

.97 MANLY
.95 MASCULINE
.59 POTENT
.58 MODEST
(.54 DECAYED)

In one of the earlier mentioned colour experiments a factor analysis was conducted, in which a potency factor seemed to answer for the largest proportion of the variance with high loading in the variable MASCULINE. If this interpretation is correct, it indicates that variations in the colouring of interiors has a very marked potency aspect (Acking, Küller 1969:1). The same experiment also showed that dark colourings make the interior more MASCULINE. The correlation with the lightness of the walls was $r = -.66$, $p < .01$. The correlation with blackness (as it is defined according to NCS, The Natural Colour System, (see Hård 1969) was $r = .65$, $p < .01$. This correlation between the dark and the masculine is, perhaps, culturally conditioned.

Sivik (1970) obtained a similar correlation in an experiment with colour samples. Dark colours were judged to be very masculine. Sivik repeated the experiment on a Greek population and writes, concerning the agreement for the two experimental groups: "WOMANLY - MANLY, $r = .93$. Very high agreement with respect to the variation over different colours, the isobar pattern is identical and thence the high correlation. But the Greeks consistently judge all colours as more FEMININE than the Swedes. This difference is significant on the .0001-level. (Nor does one ever see a Greek man in Greece with vividly coloured clothes - this would not be MANLY.)"

It would be interesting to study the relation between colours and the variable MANLY in cultures where men dress themselves in clear colours.

Social status

We do not know much of this dimension except that it occurs regularly in the factor structures, as an economic and social measurement. As with the potency factor one has a feeling of it being largely culturally conditioned (see ILLUSTRATIONS 18-19). Those variables which obtained high loadings in this factor for the interiors were:

.76	POOR	.92	<u>PRETENTIOUS</u>
.73	<u>SIMPLE</u>	.89	<u>EXPENSIVE</u>
		.87	SPLENDID
		.85	FINE
		.85	<u>WELL-KEPT</u>
		.77	MIDDLE-CLASS
		.72	SOLID
		.72	ELEGANT
		(.69	IMPRESSIVE)

The following came out for general environment:

(.50	<u>MODEST</u>)	(.51	<u>LAVISH</u>)
(.42	TEMPORARY)	(.43	<u>EXPENSIVE</u>)
(.32	CHEAP)	(.42	COMPOSITE)
		(.35	COMPACT)
		(.32	PERMANENT)

In the colour experiment quoted earlier a high negative correlation was obtained between lightness of the colouring and social status ($r = -.67$, $p < .01$) and a high positive correlation between blackness and social status ($r = .72$, $p < .01$). The dark interior colourings are thus judged to be higher with regard to status.

It is possible that this dimension creates opportunities for studying some of the motives which make people prefer one environment rather than another.

Affection

In experiments according to design 1 this dimension has appeared very faintly and with several floating variables. Some of these point to an age aspect, e.g. MODERN, NEW, AGED. Even the rest points to a feeling for the old or the genuine (see ILLUSTRATIONS 20-21). The following variables came out in the interior experiment.

(.49	<u>MODERN</u>)	.89	<u>PICTURESQUE</u>
		.82	<u>RURAL</u>
		(.44	<u>TIMELESS</u>)

The variables for general environment were:

(.54	<u>NEW</u>)	(.60	<u>AGED</u>)
(.36	TEMPORARY)	(.49	SPECIAL)
		(.30	<u>TIMELESS</u>)

In Acking, Sorte's judgement of landscape, PRIMORDIAL AND NATURAL could possibly be thought to represent this factor. The interpretation should not be driven too hard, but it is possible that when we judge environment we have, apart from a certain time perspective, a special feeling for what has had time to become a bit old (cf. the interest in antiques). Such a reasoning has lead to the working term affection for this factor.

Originality

This factor seems to mirror the unusual, the deviating, original, surprising, i.e. something one has not seen earlier (see ILLUSTRATIONS 22-23). One comes to think of Osgood's et al novelty-factor, but these writers obtained few and occasional loadings, which renders a comparison uncertain.

The following variables came out in the interior experiment:

.82 ORDINARY
.75 TIMELESS

.75 CURIOUS

And for the general environment:

.85 SURPRISING
.70 UNUSUAL
.64 SPECIAL
(.48 ORIGINAL)

One can imagine that both affection and originality have a time aspect so that the former describes a feeling for the old, while the latter describes a reaction of surprise at the new.

Discussion

We feel that we have an intuitively good understanding of 6 factors: pleasantness, complexity, unity, enclosedness, potency and social status. Other types of experiments have served to illuminate above all complexity, unity and enclosedness from particular points of view, which has lead to a certain operationalization. In spite of a few of the factors being relatively vague in their contours, it is important to include these in future experiments as well. They may turn out to possess aspects which we, hitherto, have not understood.

3:4 CAN THE MUTUAL RELATION OF THE FACTORS FORM A DEPARTING POINT FOR A THEORETICAL MODEL?

In the processing, the various factors have so far been treated as though they were independent. Pleasantness, complexity etc, have been treated as orthogonal dimensions. The pleasantness of a room e.g. has nothing to do with its enclosedness, according to this model. A certain environment may have a high enclosedness and pleasantness, while another has the same high

enclosedness but low pleasantness etc. The factors were obtained on conditions of independence. An architect is likely to oppose this reasoning. While e.g. the layman is of the opinion that light and open rooms are also pleasant, many architects may hold the opinion that high enclosedness has a direct correlation with pleasantness. Attempts have been made to investigate this correlation, but the results are so far ambiguous (e.g. Brodin, Sörensen, 1970).

Our opinion at present is that there are no such simple correlations for environment in general. It is more reasonable to assume that each environment situation has neutral zones in the different dimensions, within which it can vary without the other factors being affected. We do believe that the enclosedness of a drawing-room can be changed to a certain extent, without resulting in the pleasantness of the room being perceived as changed. If, on the other hand, one deviates too far in one direction or the other, i.e. obtains a room with extremely low or high enclosedness, then it is probably judged less pleasant. As the drawing-room has its neutral zone, then the street room may have its zone, the agricultural landscape its zone, etc.

We are of the opinion that there are such neutral zones for each type of environment in each dimension and that the zones are above all determined by the expectations the individual has in this respect. If the expectations of an individual largely correspond to his perceptions this makes possible an adequate behaviour, the individual can orientate himself and function satisfactorily, which leads to a feeling of security. In our common environment deviations from the expected may have a disturbing and even disastrous effect.

From this outlook it is clear that, if in an experiment with e.g. street rooms, one selects the experimental environments in different ways, different types of correlations between pleasantness and enclosedness may result. Sometimes they will be positive, sometimes negative and sometimes equal to zero. In our opinion, this can be explained if the expectations of the subjects on street rooms are related to the actual sample. This reasoning also covers the circumstance that variables from a factor may sometimes come out with high loading in other factors, e.g. when OPEN shows a positive correlation with pleasantness. Within the environment sample made, this word will then have had a positive meaning. This must not, however, be taken as a sign of a general correlation between these two dimensions. On the contrary, it is a sign of independence that OPEN also comes out in an orthogonal enclosedness factor.

In our results we have come across above all three factors, which show such correlations. Variables from the unity factor, such as WHOLE, UNITARY, WELL THOUGHT-OUT and others, show reasonable positive correlations with pleasantness (cf. TABLE 7 in section 2:4). We have earlier discussed whether these two factors could possibly be generally related and if one should therefore resort to oblique (not perpendicular) rotation of factors. We do, however, rather believe that within our samples of environment

there have been limited positive correlations, partly also that the unity variables may, in themselves have had a pleasantness meaning and that therefore they have not been totally adequate as measures on the unity factor. Acking, Sorte's material from the landscape experiments are well suited to test the latter assumption, since there one has measured the unity with completely different methods as well. The other correlation between the factors is negative and means that the variables WHOLE, UNITARY, WELL THOUGHT-OUT etc. also come out in the complexity factor. Acking, Sorte's material is a suitable departing point here as well.

For each landscape picture we selected the following measures of unity.

- 1 Semantic rating in the variable WHOLE
- 2 Absence of permanent units which do not fit into the environment. (The operation which was used for obtaining this measure is given in section 3:3.)

If it is as we have assumed earlier, that (2) has high validity for the unity factor, then the correlation of this measure with pleasantness and complexity should be close to zero if the factors are independent of each other while (1) at the same time shows positive and negative correlation respectively, with pleasantness and complexity. For each picture the mean value of the ratings in PLEASANT AND INVITING and IMAGINATIVE, were selected as a measure of pleasantness. The group stability between these variables was $r = .95$. The mean value of the ratings in COMPOSITE AND COMPLEX and MOTLEY AND UNTIDY were selected as measures of complexity. The group stability here was $r = .99$ and both had, furthermore, shown very high correlations with Acking, Sorte's operational definition of complexity, i.e. number of units in the environment. The correlation between the two different measures of unity, on the one hand, and pleasantness and complexity on the other hand, are presented below.

	Pleasantness	Complexity
	PLEASANT AND INVITING IMAGINATIVE	MOTLEY AND UNTIDY COMPOSITE AND COMPLEX
1 Semantic rating		
WHOLE	.61	-.65
2 Absence of permanent units etc.	.53	-.14
p = .10 for r = .44		
p = .05 for r = .51		
p = .02 for r = .59		
p = .01 for r = .64		

When (2) is used as a measure of unity, instead of (1), we see that the negative correlation with complexity sinks from $r = -.65$ to $r = -.14$ (not significant). The latter corresponds to 2 % common variance and thus practically equals zero. Where pleasantness is concerned, the correlation sinks from $r = .61$

to $r = .53$, i.e. from 37 % to 28 % common variance. Therefore it does seem as if, in spite of everything, there is a correlation between pleasantness and unity in the landscape material, even when unity is defined by the operation of Acking, Sorte.

It has been possible to calculate values in the unity factor as mean values of several semantic variables, for the interiors in main experiment 1 as well as the general environments in main experiment 2. We will now see how these relate to pleasantness and complexity. The factor values for unity, pleasantness and complexity are calculated over the variables which have, in the section on validity, been the basis for the ranking of pictures and are there to be found underlined (see 3:3).

	Pleasantness	Complexity
Unity (interiors)	.33	-.32
Unity (general environment)	.48	-.64

$p = .10$ for $r = .44$

$p = .05$ for $r = .51$

$p = .02$ for $r = .59$

$p = .01$ for $r = .64$

The same tendencies are found in this material as well. Thus we cannot disregard the possibility that the unity factor is, as a rule, related to pleasantness, at least.

We have also studied the correlation between pleasantness and enclosedness for the three materials. The variables included in the calculations are presented in section 3:3.

	Pleasantness (interiors)	(landscape)	(general environment)
Enclosedness	.06	-.24	-.45

$p = .10$ for $r = .44$

$p = .05$ for $r = .51$

$p = .02$ for $r = .59$

$p = .01$ for $r = .64$

Only for general environment there is a reasonable, albeit not a significant correlation; enclosedness and pleasantness are negatively correlated. It can therefore be noted that we have found no general correlation between pleasantness and enclosedness.

There is reason to interpret these results most carefully, since they are, so to say, ex post facto conclusions. The variables we have used here have been selected as representatives for independent factors due to the fact that they received high loadings in these factors. They have, in a manner of speaking, been selected because they are independent. Our conclusions, therefore, can only be considered to be hypotheses, which must be tested on other material.

The four factors discussed are the best established and possibly also the most interesting. One can imagine that out of these, complexity, unity and enclosedness are those dimensions with

which architects and other designers can work directly. It has been proved that complexity can be affected by, among other things, number of units and chromatic strength, the unity seems, at least in part, to depend on the fact that disturbing units of a permanent nature are not placed in the environment and the enclosedness is connected to size, demarcation and for interiors, also lightness. If the optimal combinations for various types of environments in these variables can be found, and also the neutral zones for each dimension which we mentioned in the beginning, it is possible that the security and adjustment of the individual can be predicted with fairly great accuracy.

3:5 SEMANTIC ENVIRONMENT RATINGS AND PERSONALITY

One can expect individuals to show great variations in their judgement of environment. Groups with different backgrounds and aims seem to differ, at least in certain cases (cf. section 3:1). It is also reasonable that individuals with different mental dispositions judge environments in different ways. One can, then, also imagine the possibility that they are affected in different ways by different environments. This is important to get at among other things, for preventive mental hygiene purposes.

In 1970, Acking, Sorte, conducted experiments where they let individuals rate how they thought they would be affected by 15 different landscape environments, if they were to live in them for approximately five years. (The environments are the 15 pictures in ILLUSTRATION 2.) The self ratings were carried out in the following variables, which were collected from different theories of personality and constructed as semantic scales.

SILENT/INTROVERTED
 CALM/SECURE
 IMMEDIATE/OPEN
 ANXIOUS/CAUTIOUS
 TALKATIVE/EXTROVERTED
 AGILE/QUICK (of agile and quick character)
 AGGRESSIVE (often in opposition)
 INDEPENDENT (unfettered and free)
 SOCIABLE (easily establishes contact with other people)

The mean values for each environment in the nine different scales were calculated and data was subjected to factor analysis (TABLE 17).

The writers report the following conclusion: "This division of variables into two factors implies that the individual perceives an influence of the environment in two dimensions. These two dimensions show great likeness to the co-ordinates which Eysenck (1965) terms the main dimensions of personality. The one dimension is termed introversion/extroversion and the other dimension has many different names; neuroticism (disposition to neuroses), emotionality or instability on the one hand and sta-

bility on the other."

Then two variables which would best define the respective factors, were selected (they have been underlined in TABLE 17) and these were compared with semantic ratings of the landscape pictures made earlier by the same subjects. The comparison was made by means of factor analysis. The variance for the personality-descriptive variables have been mainly distributed on pleasantness and complexity (see the underlinings in TABLE 18).

The writers interpret the result in the following way: "If we take an environment and measure the perception of this environment and find that it is rated high in pleasantness, the subjects believe that a stay in that environment would contribute to increased calmness and security as well as to a less aggressive attitude. If we consider an environment that is given a high rating in complexity, the subjects believe that a stay in such an environment would contribute to increased talkativeness and otherwise more extroverted behaviour. For environments with a low degree of pleasantness or complexity, the relations are the other way around."

If the correlations between self ratings on the one hand, and pleasantness and complexity on the other, are studied, it becomes apparent that there is a weak positive correlation between neuroticism and complexity as well.

Environment rating	Self rating			
	SILENT/ INTROVERTED	TALKATIVE/ EXTROVERTED	CALM/ SECURE	AGGRESSIVE
PLEASANT AND INVITING	-.20	.21	.89	-.79
COMPOSITE AND COMPLEX	-.76	.81	-.34	.56

p = .10 for r = .44
p = .05 for r = .51
p = .02 for r = .59
p = .01 for r = .64

Now, the objection one can raise against these self ratings is that they are, perhaps, just ordinary semantic scales of the type we described earlier. Is there for instance any difference between imagining that one will become calm and secure in an environment or simply saying that the environment is calm and secure? Probably not! The writers are aware of this and regard the self rating approach as a supplement, which creates new, interesting possibilities of formulating scales. One can formulate certain conditions in an instruction for a self rating scale, e.g. that one is to imagine a visit in the environment, a shorter stay or a permanent move to that environment etc. We have made use of these scales in another way which will be reported here.

TABLE 17. Factor analysis of self-ratings according to Acking, Sorte 1970:2.

	I	II	III	IV	V
<u>SILENT/INTROVERTED</u>	<u>.97</u>	-.04	.02	-.18	.02
<u>CALM/SECURE</u>	-.06	<u>-.97</u>	-.11	.05	-.06
IMMEDIATE/OPEN	-.91	-.39	-.02	.06	.09
ANXIOUS/CAUTIOUS	.41	.87	.02	.02	-.19
<u>TALKATIVE/EXTROVERTED</u>	<u>-.99</u>	.08	-.03	-.01	.06
AGILE/QUICK	-.98	.06	.10	-.13	.00
<u>AGGRESSIVE</u>	-.17	<u>.98</u>	.03	.00	.01
INDEPENDENT	.24	-.94	.21	-.03	-.03
SOCIABLE	-.97	.14	-.11	-.06	-.01
Proportion of total variance in %	55	41	1	1	-

TABLE 18. Factor analysis for the entire material according to Acking, Sorte 1970:2.

	I	II	III	IV	V	VI
COMPOSITE/COMPLEX	.29	<u>.75</u>	.33	-.38	.09	.15
PLEASANT/INVITING	<u>-.90</u>	.18	.24	.06	.19	.04
LIGHT/OPEN	.03	-.16	-.78	.03	-.01	.00
WHOLE	-.77	-.17	-.25	.51	-.08	.03
NUMBER OF ANNOTATED UNITS	.58	.47	-.02	-.61	-.05	.00
<u>SILENT/INTROVERTED</u>	.03	<u>-.98</u>	-.06	.03	.05	-.02
<u>TALKATIVE/EXTROVERTED</u>	.00	<u>.96</u>	.16	-.11	.05	-.06
<u>AGGRESSIVE</u>	<u>.95</u>	.22	.14	-.14	.02	.07
<u>CALM/SECURE</u>	<u>-.98</u>	.00	.04	.12	-.11	-.01
Proportion of total variance in %	51	30	8	3	1	-

Problem

Is there any correlation between the personality of the individual and his rating of how he believes himself to be affected by different environments? On the basis of the results of Acking, Sorte, we selected the Swedish version of Eysenck Personality Inventory. This personality questionnaire has been developed with the aid of factor analysis and measures two dimensions, partly extroversion - introversion, partly neuroticism - stability. Furthermore, it contains a lie-scale. A score which is too high in this scale also makes the scores in the other two scales suspect, according to Eysenck.

Eysenck describes the typical extrovert individual in the following way: "The typical extrovert is sociable, likes parties, has many friends, needs to have people to talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment, and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer, and generally likes a change; he is carefree, easygoing, optimistic and likes to 'laugh and be merry'. He prefers to keep moving and doing things, tends to be aggressive and lose his temper quickly; altogether his feelings are not kept under tight control, and he is not always a reliable person."

The typical introvert is: "A quiet retiring sort of person, introspective, fond of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, 'looks before he leaps' and distrusts the impulse of the moment. He does not like excitement, takes matters of everyday life with proper seriousness and likes a well-ordered mode of life. He keeps his feelings under close control, seldom behaves in an aggressive manner, and does not lose his temper easily. He is reliable, somewhat pessimistic and places great value on ethical standards" (Eysenck and Eysenck 1964).

The following questions were posed before the experiment:

- a Are the self rating variables distributed in two factors and in the way described by Acking, Sorte?
- b Do the self rating variables show the correlations with pleasantness and complexity described by Acking, Sorte?
- c Do stable and neurotic individuals vary in expected environment influence?
- d Do extroverted and introverted individuals vary in expected environment influence?
- e Is expected influence different for environments with high and low pleasantness respectively?
- f Is expected influence different for environments with high and low complexity respectively?
- g Is there any interaction between personality, self rating and type of environment?

Method

The 15 interiors from main experiment 1 were shown to a group of persons consisting of 30 female domestic-economy teachers. These rated how they thought they would become if they stayed in the respective environments over a period of five years. Then they were tested with Eysenck Personality Inventory. The questionnaire used was EPI, Swedish version, Form A. The subject read the instruction printed on the title page and then answered the questions by ticking Yes or No. (The Swedish version is extensively described in Bederoff-Peterson, Jägtoft, Åström 1968.)

Result

Partition of individuals: The 30 individuals were divided into a high and low group with reference to neuroticism, here termed neurotic (N+) and stable (N-) as well as in a high and low group with reference to extroversion, termed extrovert (E+) and introvert (E-). They were distributed in the manner indicated below. (Raw scores according to EPI within parentheses.)

Extroversion	Neuroticism		
	Low (4-9)	High (10-19)	
High (12-15)	9	6	15
Low (7-11)	6	9	15
	15	15	

As can be seen, the two bases for division are relatively independent. The delimitations came out so fortunately that two groups of 15 individuals each were obtained for neuroticism as well as extroversion.

Partition of interiors:

The five interiors judged most pleasant (P+) and the five which were judged least pleasant (P-).

The five interiors judged highest (C+) and lowest (C-) in complexity.

Both samples are based on mean values from the variables indicated in section 3:3. Thus, the pictures correspond to rank 1-5 and rank 11-15 in ILLUSTRATIONS 4 and 7 (pleasantness) and (complexity).

Introductory processing of the self rating variables

Mean values for the 15 environments were calculated in each variable. The variables were then correlated and the matrix factor analysed (thus, this is a typical design 1-variation). The factor matrix is presented in TABLE 19.

The factor structure came out most stable with the major part of the variance in the first two factors. These can be identified as extroversion and neuroticism. Extroversion has high loadings in seven variables:

TABLE 19. Factor analysis of the self-ratings of domestic economy teachers.

	I	II	III	IV	V	VI
SILENT/INTROVERTED	-.87	-.42	-.10	.01	.16	.02
IMMEDIATE/OPEN	.89	.38	.21	.01	-.05	.01
SOCIABLE	.78	.44	.43	-.02	-.01	-.03
CALM/SECURE	.39	.86	.30	.00	.00	.06
AGGRESSIVE	-.26	-.95	.03	.03	.01	.04
AGILE/QUICK	.96	.18	.00	.14	.02	.03
INDEPENDENT	.90	.30	.09	-.23	.01	.00
TALKATIVE/EXTROVERTED	.85	.40	.32	-.05	.02	.06
ANXIOUS/CAUTIOUS	-.89	-.39	-.16	.06	-.13	.05
Proportion of total variance in %	84	11	2	1	-	-

		+	
.89	ANXIOUS/CAUTIOUS	.96	AGILE/QUICK
.87	SILENT/INTROVERTED	.90	INDEPENDENT
		.89	IMMEDIATE/OPEN
		.85	TALKATIVE/EXTROVERTED
		.78	SOCIABLE

While Acking, Sorte reported INDEPENDENT and ANXIOUS/CAUTIOUS in the neuroticism factor, here they came out in the extroversion factor. The fact that they float in this way may depend either on the pictorial material, interiors instead of landscapes, or it may also depend on the experiment groups, domestic-economy teachers versus high-school students.

Neuroticism has high loadings in:

+		-	
.86	CALM/SECURE	.95	AGGRESSIVE

These are the same as the highest loaded variables of Acking, Sorte in this factor. Thus, we can, in principle, accept the fact that the self rating variables divide into two dimensions while the distribution of variables becomes somewhat different (see point a and b under problem).

As a measure of self rated extroversion we will now use the mean value of all 7 variables which obtained high loadings in factor 1. As a measure of self rated neuroticism the mean value of the two variables which obtained high loadings in factor 2 will be used. (Certain of the variables were turned before calculating mean value.) The continued processing was made by means of variance analyses. They are here presented in the form of matrixes with discussion appended. The first four relate to self rated extroversion, the last four to self rated neuroticism. (The variance analyses are found in APPENDIX F1.)

Discussion of analysis 1. Dependent variable: extroversion

	Environments		
Individuals	C-	C+	
Extrovert	4.03	4.08	4.05
Introvert	4.06	4.11	4.09
	4.05	4.09	4.07

Neither the complexity of the environments, nor the division of individuals in extrovert and introvert affect the self rated extroversion. Acking, Sorte's results, that one believes oneself to become more extroverted the more complex the environment, has thus not been confirmed.

Discussion of analysis 2. Dependent variable: extroversion

Individuals	Environments		
	C-	C+	
Stable	4.27	3.93	4.10
Neurotic	3.82	4.26	4.04
	4.05	4.09	4.07

When, instead, the individuals are divided into neurotic and stable a faint interaction is obtained, implying that the neurotics believe themselves to become more extroverted in environments of high complexity, while the stable persons believe themselves to become more extroverted in environments of low complexity. Thus, the neurotics react here in the same way as the high-school group of Acking, Sorte while the stable persons react in the opposite way.

Discussion of analyses 3 and 4. Dependent variable: extroversion

Individuals	Environments		
	P-	P+	
Extrovert	3.06	4.62	3.84
Introvert	2.95	4.73	3.84
	3.01	4.68	3.84

Individuals	Environments		
	P-	P+	
Stable	3.20	4.66	3.93
Neurotic	2.82	4.70	3.76
	3.01	4.68	3.84

The individuals believe throughout that they will become more extroverted in the more pleasant environments. This does not agree with the results of Acking, Sorte. They found no correlations here. The divisions of individuals do not give rise to any differences in these cases.

Summary of analyses 1-4; self rated extroversion

Instead of obtaining high correlations between rated extroversion and the complexity of the environment, we obtained such a correlation with the pleasantness of the environment. This does not agree with the result of Acking, Sorte, reported on earlier. A tendency in the same direction as in the earlier experiment was obtained for the neurotic group, but this tendency was not very strong.

Discussion of analysis 5. Dependent variable: neuroticism

Individuals	Environments		
	C-	C+	
Extrovert	3.46	4.41	3.93
Introvert	3.43	4.43	3.93
	3.45	4.42	3.93

The individuals believe themselves to become more neurotic in environments of high complexity independent of whether they, themselves are extroverted or introverted. A tendency in the same direction was obtained by Acking, Sorte.

Discussion of analysis 6. Dependent variable: neuroticism

Individuals	Environments		
	C-	C+	
Stable	3.01	4.49	3.75
Neurotic	3.88	4.35	4.12
	3.45	4.42	3.93

Same result as the previous. Both groups believe themselves to become more neurotic in those environments which are of high complexity, but when the individuals are divided in neurotic and stable two things appear. The neurotics believe on the average that they will become more neurotic. At a closer scrutiny of the significant interaction one does, however, find that the whole difference between the neurotic and stable persons concerns those pictures which are of low complexity. The stable group believe themselves to be favourably affected by these environments (ratings of neuroticism = 3.01), while this is not the case to the same extent for the neurotic group (rating of neuroticism = 3.88). This result is very interesting to the extent that the differentiation obtained by the personality test proves meaningful in connection with the semantic ratings.

Discussion of analysis 7. Dependent variable: neuroticism

Individuals	Environments		
	P-	P+	
Extrovert	4.26	3.41	3.84
Introvert	4.38	3.25	3.81
	4.32	3.33	3.83

The individuals believe that they become less neurotic in the pleasant environments, irrespective of whether they themselves are extroverted or introverted. The general tendency agrees with the correlation between self rated neuroticism and pleasantness of environment obtained by Acking, Sorte.

Discussion of analysis 8. Dependent variable: neuroticism

Individuals	Environments		
	P-	P+	
Stable	4.05	3.25	3.65
Neurotic	4.59	3.41	4.00
	4.32	3.33	3.83

When individuals are divided into one stable and one neurotic group, a faint difference is obtained in so far as the more

neurotic on an average believe that they become more neurotic irrespective of the pleasantness of the environment. This agrees with our earlier results. As in the former case one does, throughout, consider that one becomes less neurotic in the pleasant environments.

Summary of analyses 5-8, self rated neuroticism

The more neurotic group does, in general believe themselves to become more neurotic than the stable group. This can be interpreted in such a way that these individuals have a neurotic style of response irrespective of whether they are concerned with self ratings with semantic scales or EPI. The experimental subjects do, on an average, believe that they will become more neurotic in environments of high complexity and low pleasantness. For environments of low complexity the stable and neurotic group differ to the extent that the stable persons believe themselves to be favourably affected by these environments.

Summary

Differences between our results and earlier may be due to the fact that while Acking, Sorte used the same group of high-school students for judging environments as well as self ratings, we used a group of high-school students for judging environments and a group of domestic-economy teachers for the self ratings. The difference can also depend on the fact that the earlier experiment concerned landscape environment while we used interiors. At any rate the subjects believe that they are affected differently both concerning pleasantness and complexity. Furthermore, more neurotic individuals differ from more stable ones.

The next step in this research will be to investigate whether actual environment has such a differentiating effect. This problem is actually the focal point in this entire research project. It seems definitely possible to turn to field experiments within a near future.

4 SUMMARY AND DEVELOPMENT

4:1 EVALUATION OF THE METHOD

The factor structures obtained create an opportunity for a differentiated and apparently meaningful description of different environments. The semantic rating method is no perfect measuring instrument, but a long line of experiments have shown that it is practically applicable. The method has high group stability and good possibilities for further validating. It is also applicable on very varying environments from landscapes to drawing-rooms. The dimensions can be rated both according to design 1 (comparison between environments) as well as design 2 (rating against an inner frame of reference). The former design does, however, probably yield a better differentiation.

The problem that a variable does not always measure the same dimension but that it floats is encumbersome, but not at all unique to the semantic method. One need only think of the unsuccessful attempts which have been made to construct generally valid intelligence tests, i.e. cross-cultural tests. As early as 1910 one attempted to measure intelligence in immigrants to the USA and since the language difficulties were considerable all verbal items were removed and instead non-verbal performance tests were developed. Ortner (1963) summarized the experience of these experiments in the following manner: "On the basis of our results it appears that, both from the practical point of view and on theoretical grounds, the verbal tests and items are better suited as inter-cultural measuring instruments than any other kind. They must, of course, be translated and adapted, but this adaptation is infinitely easier and more reliable than the well-nigh impossible task of 'translating' and adapting a performance test. The 'language' of performance is the cultural perception, but its 'words' and grammar and syntax are not even completely understood, let alone organized in national entities. We do not know how to 'translate' a picture into the representational language of a different culture, but we are thoroughly familiar with the technique and requirements of translating verbal contents ... A concept that is non-existent in a certain language simply cannot be translated into this language, a factor which acts as a safeguard against mechanical use of a given instrument when adapting it for a different culture."

Nowadays one develops intelligence tests for very small populations instead, e.g. one for each year in primary and secondary school. The semantic method thus measures up well in comparison, in spite of the fact that the measuring of intelligence during the last half-century has been a gigantic industry. Not even precise physical methods of weighing and measuring are generally valid. One need only recall that a scale of the feather type gives different weights at sea level and on a mountain. In space it does not work at all. The metre is elongated or shortened if one travels at high speed in relation to the object of measurement etc.

The semantic method should simply be used as long as it proves to yield applicable results. One intention with this presentation has been to attempt at mapping the cases in which one can expect such results.

4:2 DEVELOPMENT OF A TEST

The best variables have been compiled in a test which will be described here. This has been done for four reasons. First of all we wish to systematize our own continued work. By always including the same test, on its own or as a supplement, we will have greater opportunities for comparison. Secondly it is our hope that other researchers will be able to use the test, which would lead to improved communications on mutual problems. The third reason is that people in the field, architects, planners, behavioural scientists, could possibly find practical use for this type of test, in designing environments and in education as well as for environmental therapy. And finally, the construction of the test is a natural summary of the research conducted so far. The pre-requisites are given, the material is, so to say, just lying about waiting.

Selection of response variables

Main experiments 1 and 2 were the bases for selection of variables. Here main experiment 2 weighed heaviest since it could be considered more general. The supply of suitable variables for the pleasantness factor was very good, while it was limited for the remaining 7 factors. From a preliminary scrutiny we decided to select 8 variables for pleasantness and 4 for each of the other factors. The selection was made by three experienced experimenters based on the following criteria.

In order for a variable to be used as a measure of a factor it must:

- a have obtained a high loading in this factor and low loadings in the others (in both main experiments or only in main experiment 2)
- b not have shown any tendency to float between main experiment 1 and 2
- c be meaningfully applicable to environment in general
- d Within each factor variables fulfilling points a - c but which were also of mutually different characters were favoured. Direct synonyms and opposites were avoided, in as far as possible.

Here follows a list of the selected variables for each factor (the negative are to be turned when processing):

Pleasantness

-

+

BRUTAL
UGLY
BORINGGOOD
IDYLLIC
STIMULATING
PLEASANT
SECURE

Complexity

-

+

SUBDUED

MOTLEY
LIVELY
COMPOSITE

Unity

-

+

FUNCTIONAL
WHOLE
CONSISTENT
OF PURE STYLE

Enclosedness

-

+

AIRY
OPENDEMARCATED
CLOSED

Potency

-

+

FEMININE
FRAGILEPOTENT
MASCULINE

Social status

-

+

SIMPLE

EXPENSIVE
LAVISH
WELL-KEPT

Affection

-

+

MODERN
NEWTIMELESS
AGED

Originality

-

+

ORDINARY

CURIOUS
SPECIÁL
SURPRISING

Order of presentation

Since each factor is measured with at least 4 variables we have been able to use only one order of presentation and still have each factor represented in both the first, second, third and fourth part of the test. The order of presentation as well as the factor belonging is presented in TABLE 20. The relation between each variable and the respective dimensions is marked out.

Administration of the test

This can be made according to design 1 or design 2 (section 1:6). Note that the results for pleasantness in the latter case probably contain greater error variance. The experimental situation must be similar for all individuals taking part in an experiment. In a pictorial presentation lighting, exposure time, position of subjects and projector must be similar and favourable. The slides must be presented in different orders for different sub-groups. In field experiments, weather, time of day etc. must be as similar as possible. The subjects must of course, be selected so that the result can be generalized in the desired manner. Note that individuals who are deeply involved in what is to be judged, are usually a special case as experimental subjects. They tend to regard almost all variables as pleasantness evaluating. Among other things we obtained great differences between residents and visitors when judging a housing development in an investigation of methods of presentation (Acking, Sorte 1972:2). On an average the residents judged their development higher in pleasantness. Furthermore, variables such as light and open obtained a strong tone of pleasantness for the residents, which was not the case for visitors.

The following instruction can be given in writing or orally. Only the nature of what is to be judged must be altered to fit a definite occasion (marked by underlining in the instruction).

INSTRUCTION

It is possible to judge an environment in a great number of ways. One may e.g. think that it is more or less big, more or less beautiful or more or less unitary.

This booklet contains a number of rating scales where you are asked to mark the way in which you perceive the room in which you are in different respects.

The following is an example of a rating scale.

BIG

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

Immediately above the scale you will find indicated the quality of the room implied by the scale (BIG). You mark by ticking one square. The scale has seven steps. The square to the far left implies slightly and the square to the far right implies very much of the quality.

All ratings are to be carried out while you are in the room.

Begin by writing your name etc. at the bottom of this page. Then turn a page and commence.

NAME (and other required information)

TABLE 20. The variables ordered as they appear in the test.

Variable	Factor	Relation to factor
1 MODERN	Affection	neg
2 MOTLEY	Complexity	pos
3 UGLY	Pleasantness	neg
4 CURIOUS	Originality	pos
5 EXPENSIVE	Social status	pos
6 MASCULINE	Potency	pos
7 STIMULATING	Pleasantness	pos
8 CLOSED	Enclosedness	pos
9 FUNCTIONAL	Unity	pos
10 WELL-KEPT	Social status	pos
11 ORDINARY	Originality	neg
12 SECURE	Pleasantness	pos
13 OF PURE STYLE	Unity	pos
14 BORING	Pleasantness	neg
15 FRAGILE	Potency	neg
16 SUBDUED	Complexity	neg
17 TIMELESS	Affection	pos
18 OPEN	Enclosedness	neg
19 IDYLIC	Pleasantness	pos
20 SURPRISING	Originality	pos
21 SIMPLE	Social status	neg
22 AGED	Affection	pos
23 CONSISTENT	Unity	pos
24 LIVELY	Complexity	pos
25 GOOD	Pleasantness	pos
26 DEMARCATED	Enclosedness	pos
27 POTENT	Potency	pos
28 NEW	Affection	neg
29 LAVISH	Social status	pos
30 COMPOSITE	Complexity	pos
31 PLEASANT	Pleasantness	pos
32 FEMININE	Potency	neg
33 WHOLE	Unity	pos
34 BRUTAL	Pleasantness	neg
35 SPECIAL	Originality	pos
36 AIRY	Enclosedness	neg

In group experiments one can also advise the subjects on how to correct a writing mistake in a simple way by drawing a circle around the faulty tick and then making a new tick. One should also inform them that the communication with the experimenter is done by putting up a hand. (The test is presented in appendix, as well as a form for processing, APPENDIX G1 and G2 for English version, APPENDIX H2 and H3 for Swedish version).

Design 1 demands one response record for each environment. An alternative for experimental investigations is to use the form included in main experiments 1 and 2, i.e. with one variable at the time in which all pictures are to be judged before the next variable is presented. In this case we recommend a balancing of each separable variable according to the procedure described in section 1:6.

4:3 RELIABILITY OF THE TEST AND INDEPENDENCE OF THE FACTORS

Only one experiment has so far been made in order to study the reliability of the test. A group of architecture students at The Lund Institute of Technology judged a lecture hall twice with two weeks in between. On both these occasions the judgement was made under similar circumstances in connection with a lecture and when all subjects were present in the lecture hall. The experimental conditions were not ideal for practical reasons. More well-controlled forms would probably give higher reliability. Instructions etc. were in accordance with those reported. Special precautions were taken so that the subjects would not collaborate. Those who sat close to each other received the reply forms at different periods in time, which meant that they would probably not work with the same page. Three experiment leaders checked that the instructions, given in writing, were followed.

Reliability

30 persons brought up in Sweden had taken part on both occasions (see APPENDIX G3). For these we first calculated the reliability of each variable, TABLE 21. Then the separate scores for each individual were summed up to factor scores and the reliability for the factors were calculated. These values are also to be found in TABLE 21.

The reliability for the separate variables vary from high over reasonable to low. The reliability for the factors is reasonable for affection ($r = .66$) while it for the remainder varies between .71 and .86, i.e. from 50-75 % common variation, which is fully satisfactory in group experiments. In time, we plan to construct a longer version of the test, with approximately 20 variables per factor. Here a higher reliability will be obtained and the significance of single floating variables will decrease. Each factor will, furthermore, be better covered. Before constructing such a test, more knowledge about the meaning of each separate variable must be obtained.

TABLE 21. Reliability for variables and factors in the test
(N = 30).

Variables			
GOOD	.58	MODERN	.60
BRUTAL	.69	NEW	.69
UGLY	.19	TIMELESS	.58
IDYLLIC	.62	AGED	.72
STIMULATING	.66		
PLEASANT	.83	CURIOUS	.33
SECURE	.67	SPECIAL	.78
BORING	.53	ORDINARY	.79
		SURPRISING	.52
MOTLEY	.55		
SUBDUED	.44		
LIVELY	.64	Factors	
COMPOSITE	.56		
		Pleasantness	.84
FUNCTIONAL	.61	Complexity	.75
WHOLE	.64	Unity	.78
CONSISTENT	.39	Enclosedness	.80
OF PURE STYLE	.51	Potency	.71
		Social status	.86
DEMARCATED	.53	Affection	.66
AIRY	.77	Originality	.78
CLOSED	.56		
OPEN	.46	p = .10 r = .31	
		p = .05 r = .36	
FEMININE	.64	p = .02 r = .42	
POTENT	.55	p = .01 r = .46	
MASCULINE	.84		
FRAGILE	.64		
EXPENSIVE	.69		
SIMPLE	.39		
LAVISH	.82		
WELL-KEPT	.74		

Control of independence of factors

The experiment we have reported is too limited for a factor analysis to attain a stable structure. Since the experimental group is homogeneous and only one environment is used, the factor structure would be occasional and only interpretable in the rough manner reported for the earlier design 2 experiments. One can, however, simply present the correlation matrix for the 8 factors and as a comparison include the reliability coefficients in the diagonal (see TABLE 22).

Correlation between the various factors is calculated over 46 individuals (those who took part in the first judgement situation) while the reliability is calculated over 30 individuals (according to the above).

It becomes apparent that the factor reliability in all cases is much higher than the correlations between the various factors. While all reliabilities are significant, only three out of the 28 correlations are significant ($p < .01$). One of these is the earlier reported negative correlation between unity and complexity. The two others concern the originality factor which shows some correlation with complexity and status. Nor is there any positive connection between pleasantness and unity, which may be due to the fact that the variables FUNCTIONAL and CONSISTENT have had the desired effect. The different factors can therefore be said to have measured different aspects of the environment in a reliable manner.

4:4 FUTURE PERSPECTIVE

One of the most interesting qualities of experience is that it varies in time, sometimes fairly continuously but often through sudden turnings. Whether we move in the surroundings or stand still and let our eyes wander or perhaps just let our thoughts wander, the total situation of which experience is a part, changes all the time.

In order to have the opportunity of studying these different aspects, the semantic scale has been constructed as a simple instrument with a lever, which can be set in 7 different positions. The movements of this lever are registered by a recorder. This instrument can be used to study various types of processes. The apparatus admits that as many as 20 persons make judgements at the same time. The mean value and the variance are continuously calculated and recorded. Experiments are being made at present to compare this continuous registration with the rating scales presented earlier. At the same time as the measuring side has been elaborated, an apparatus for presenting planned environment has been constructed, which makes it possible for a subject to travel, in a manner of speaking, in a plastic environment model. The most significant components in this apparatus are a servo guided TV-camera with special optics (relatoscope) as well as a manoeuvring unit for the subject and a registra-

TABLE 22. Correlation matrix for the factors. Coefficients of reliability are given in the diagonal.

	PL	CO	UN	EN	PO	SO	AF	OR
Pleasantness	.84	.24	.20	-.12	.00	-.06	-.25	.04
Complexity	.24	.75	-.50	.14	-.12	.11	.02	.54
Unity	.20	-.50	.78	.16	.32	-.04	-.07	-.30
Enclosedness	-.12	.14	-.16	.80	-.10	-.02	.16	-.09
Potency	.00	-.12	.32	-.10	.71	-.07	-.03	-.17
Social status	-.06	.11	-.04	-.02	-.07	.86	-.19	.43
Affection	-.25	.02	-.07	.16	-.03	-.19	.66	-.19
Originality	.04	.54	-.30	-.09	-.17	.43	-.19	.78

For correlations: $p < .01$ for $r = .37$

For reliabilities: $p < .01$ for $r = .46$

tion unit for the experiment leader. The way in which this combination of presentation and measuring technique intended to function is briefly described in Acking, Sorte 1972:2.

Another important side of the continued research is extracting semantic norms. There are norms for e.g. noise and chemical pollution, but not for total perception of environment. Nobody has demanded norms for pleasantness, unity, complexity etc. in spite of it probably being important to the entire organism. One does, perhaps, not seriously believe that it would be possible to achieve such norms. Therefore it would be most interesting if it should prove meaningful to investigate e.g. a large number of working environments by means of the semantic method and use other measuring methods as criteria. Perhaps one would then find that the semantic description, because of its rough and general nature, covers many small bits which are important to the health and comfort of the individual. It would be interesting to try and bring out the optimal factor profile and span of the neutral zones which we earlier assumed to be in existence for e.g. a working environment. Then it is also possible that the difference in factor structure between involved and uninvolved subjects in itself can be utilized as a measuring instrument; by comparing the way in which the variance of different groups is distributed over factors.

The third and perhaps most important research task in the long run is the continued validation of the various factors. This must be made if we are ever to attain a deeper understanding of the dynamic process which the interplay between individual and environment constitutes. It seems possible here to make use of observations of overt behaviour and neurophysiological processes. Preparations for such studies have already been made. The presentation apparatus mentioned above does also create opportunities for registering eye movements. A start has recently been made to investigate possible connections between complexity, unity and cortical activation patterns. The arousal pattern which is guided via the reticular formation in the brain stem, can very well be assumed to be related to the complexity and unity of the environment. If such a relation was found, the usage of the semantic method would be further widened.

REFERENCES

- Acking, C-A, Küller, R, 1968:2, Perception av en interiör. Jämförelse mellan bedömning i fullskala och från film. (Formlära, LTH) Lund, Sweden.
- Acking, C-A, Küller, R, 1968:5, Färgens betydelse vid perception av en interiör. Färgsättning av inredningsdetaljer. (Formlära, LTH) Lund, Sweden.
- Acking, C-A, Küller, R, 1969:1, The perception of an interior as a function of its colour. II Colour of interior walls. (Lund Institute of Technology, Department of theoretical and applied Aesthetics) Lund, Sweden.
- Acking, C-A, Sorte, G J, 1969:2, Perception av landskap. Komplexitetens betydelse. (Formlära, LTH) Lund, Sweden.
- Acking, C-A, Sorte, G J, 1970:1, Perception av landskap. Helhetens betydelse. (Formlära, LTH) Lund, Sweden.
- Acking, C-A, Sorte, G J, 1970:2, Perception av landskap. Studie beträffande hur individen tror sig påverkas av olika miljöer. (Formlära, LTH) Lund, Sweden.
- Acking, C-A, Sorte G J, 1972:2, Metoder för presentation av planerad miljö. (Formlära, LTH) Lund, Sweden.
- Anastasi, A, 1968, Psychological Testing. (The MacMillan Company) London.
- Bederoff-Peterson, A, Jägstoft, K, Åström, J, 1968, Eysenck Personality Inventory (EPI). The Swedish version - Testdata och synpunkter. (Skandinaviska Testförlaget AB) Stockholm.
- Bopp, J, 1955, A quantitative semantic Analysis of Word Association in Schizophrenia. Unpublished doctor's dissertation. University of Illinois. 132, 170, 223-26. 227.
- Brodin, C, Sörensen, S, Individers värderingar av simulerade utemiljöer - en fältstudie; in Hesselgren, 1970, Årsredogörelse för verksamhetsåret 1969-70 beträffande arkitekturel perception. Sigtuna, Sweden.
- Eysenck, H J, Eysenck, S B G, 1964, Manual of the Eysenck Personality Inventory. (University of London Press) London.
- Gärling, T, 1970, Upplevelsen av en arbetsmiljös arkitekturela utformning. En undersökning med semantiska skalor. (Psykologiska Institutionen, Stockholms Universitet) Stockholm.
- Harman, H H, 1967, Modern Factor Analysis. (The University of Chicago Press) Chicago, London.
- Helson, H, 1964, Adaptation-Level Theory. An experimental and systematic Approach to Behaviour. (Harper & Row) New York.
- Hård, A, 1969, Short description of the NCS Colour Order System. (Swedish Colour Centre) Stockholm.
- Kelley, T L, 1940, Comment on Wilson and Worcester's "Note on Factor Analysis". Psych. 5, 117-120.
- Kerlinger, F N, 1967, Foundations of behavioral Research. Educational and psychological Inquiry. (Holt Rinehart and Winston Inc.) New York, Chicago, San Francisco, Toronto, London.

- Kilpatrick, F P, 1961, Explorations in transactional Psychology. (New York University Press) New York.
- Küller, R, 1971:1, Rumsperception. (Formlära, LTH) Lund, Sweden.
- Likert, R, 1932, A Technique for the Measurement of Attitudes. Archives of Psychology No. 140.
- Ord för Ord. Svenska synonymer och uttryck, 1960, 1964. (Nordiska uppslagsböcker) Stockholm.
- Ortar, G, 1963, Is a verbal test cross-cultural? (Hebrew University, Jerusalem) Scripta Hierosolymitana. 13 219-235.
- Osgood, C E, Suci, G J, Tannenbaum, P H, 1957, The Measurement of Meaning. (University of Illinois Press) Urbana.
- Sivik, L, 1970, Om färgers betydelse (with English summary: Colour connotations and perceptive variables). (Swedish Colour Centre) Fackskrift nr 9. Stockholm.
- Sorte, G J, 1971, Perception av landskap (with English summary). (Landbruksbokhandelen/Universitetsforlaget) Ås, Norway.
- Spearman, C, 1904, "General Intelligence" objectively determined and measured. American Journal of Psychology, 15 201-293.
- Spearman, C, 1927, The abilities of Man. (Macmillan) New York.
- Stagner, R, Osgood, C E, 1946, Impact of war on nationalistic frame of reference: I. Changes in general approval and qualitative patterning of certain stereotypes. J. soc. Psychol. 24, 187-215, 24-25, 85, 222, 226-27.
- Svenska Akademiens ordlista över svenska språket, 1950. (Svenska Bokförlaget/Norstedts) Stockholm.
- Thurstone, L L, 1938, Primary mental abilities. Psychometric Monographs No. 1.
- Thurstone, L L, Chave, E J, 1929, The Measurement of Attitudes. (University of Chicago Press) Chicago.
- Thucker, W T, 1955, Experiments in aesthetic communications. Unpublished doctor's dissertation, University of Illinois, 68-70, 291-95.

Wordbank: Sample of descriptive words from the index of the Royal Swedish Academy 1950. The words are grouped in the way in which they were arranged for the purpose of sampling for main experiment 1.

1

nice	ideal	offensive
homelike	inspiring	impopular
inviting	dismal	objectionable
inhospitable	sweet	liked
cosy	exquisite	unsympathetic
unpleasant	tempting	popular
pleasant	macabre	esteemed
thriving	miraculous	
	monstruous	
	disagreeable	

2

attractive	dreadful
enchanted	distasteful
agreeable	nasty
captivating	paradisiac
charming	refined
shocking	seedy
lovely	ghastly
delicious	horror-filled
fair	horrifying
appalling	frightening
fascinating	beauteous
repulsive	stimulating
ugly	gorgeous
arresting	nice
terrible	wondrous
awful	excellent
delightful	choice
bewitching	beautiful
grotesque	abominable
horrid	disgusting
frightful	repugnant
terrifying	unearthly
ravishing	
wonderful	

3

abhorred

4

windy
still
stormy
shielded

5

safeguarding
subduing
peaceful
irritating
calm
calming
soothing to the nerves
nerve-racking
thrilling
unplacid
ominous
worrying
unrestful
troubling
saturated with worry
serene
soothing
disturbing

exciting	discoloured	inhabited
restful	mismanaged	built-up
	not properly kept	populated
	rambling	lonely
6	well-groomed	solitary
individualistic	well looked after	isolated
individual	well polished	uninhabited
impersonal	well managed	unpopulated
personal	well kept	deserted
standardized	over-grown	desolate
subjective		
	8	11
7	used	barbaric
civilized	worn	brutal
dusty	second-hand	friendly to people
faded	deformed	human
decayed	deranged	inimical to culture
neglected	fresh-looking	misanthropic
sallow	worn-out	humane
filthy	destroyed	inhuman
half-wild	rotten	unfriendly
healthy	new	friendly
dirtied	newly erected	
shabby	trite	
worn out	unused	12
smudged	unutilized	pleasurable
uncivilized	worn	enjoyable
unhealthy	worn out	discomforting
cared for		unenjoyable
tidy		
neat	9	
trim	uncertain	13
full of flaws	unreliable	silly
littered	insecure	foolish
slovenly	protected	ridiculous
dirty	secure	humorous
smutty		idiotic
sober		comical
battered	10	amusing
	secluded	ludicrous

merry	16	hard
spirited	comfortable	
funny	uncomfortable	
frolicsome		23
boring		airy
extremely dull	17	easy
fatuous	scented	massive
	nasty-smelling	frail
	stinking	solid
14	fragrant	slender
serious		brittle
distressed		heavy
depressing	18	dense
dejected	icy	
agitated	cold	
cheerful	chilly	24
jovial	cool	demarcated
unhappy	cooling	secluded
downhearted	warm	screened-off
low-spirited	generating warmth	stifled
depressed		built-in
excited		squeezed-in
exhilarated	19	isolated
full of sadness	dangerous	stuffy
	harmless	stifling
	not dangerous	airy
15	risky	impenetrable
acceptable	riskless	impregnable
tolerable		framed
able		enclosed
sought after	20	unsheltered
worth striving for	inflammable	inaccessible
advantageous	fire-proof	spacious
reprehensible		closed
blameworthy		sealed
model	21	extended
unacceptable	rhythmical	wide open
inadmissible		open
unreasonable		
recommendable	22	
desirable	soft	

25		
gigantic	barren	womanly
enormous	sunny	sexless
small	summery	mannish
immense	wintery	manly
stately	spring-like	masculine
big		virile
narrow		
widespread	29	
vast	full	32
voluminous	conglomerated	brittle
mighty	cluttered	fleeting
	hollow	tensed
	full of knick-knacks	rough
26	unfilled	feeble
illuminated	chock-a-block	compact
semi-dark	messy	potent
light	untidy	narrow
dark	empty	slight
not illuminated	well-supplied	slender
shaded	abundant	thin
lighted	encumbered	
		33
27	30	dynamic
transparent	full	fixed
clear as glass	thin	powerful
turbid	compact	alive
semi-transparent	concentrated	lively
clear	unconcentrated	immovable
crystal clear	compressed	immobile
opaque	dispersed	mobile
hazy	scattered	static
	dense	formal
		violent
28		
frozen	31	
verdant	feminine	34
autumn-like	womanish	dominating
icy	emasculated	craving for power

tyrannical
superior
overwhelming

35

stout
firm
loose
unsteady
steady

36

powerful
powerless
marrowless
robust
weak

37

shiny
pale
palish
glistening
gleaming
motley
discreet
subdued
spotted
iridescent
glittering
glossy
glaring
considerate
indiscreet
matt
frosted
moderate

gaudy
shimmering
twinkling
faded

38

boisterous
noisy
subdued
loud
soundless
quiet

39

demonstrative
insipid
prominent
striking
conspicuous
marked
imperceptible
unnoticeable
significant
sensational
obvious
indifferent
startling
defiant
vague

40

adorned
bare
flowered
garlanded
decorated
ornamented

gilded
naked
ungilded
undecorated
chic
embellished
filled with finery
lavish
ornate

41

chaotic
slovenly
tidy
systematic

42

explosive
severe
mild
modest
rash

43

useful
usable
precipitate
reasonable
judicious
futile
purposeful
ineffective
irrational
malplaced
good
utilitarian
useless

		46
inapplicable	costly	graceful
badly thought-out	profitable	gracious
unsuitable	worth its price	clumsy
undiscerning	rich	dainty
unmotivated	of constant value	shapeless
of no use	valuable	ungracious
unnecessary		ungainly
disorganized		elegant
impractical	45	
incorrect	banal	
unserviceable	enormous	47
inappropriate	fantastic	assuming
impulsive	outstanding	modest
planned	petty	unassuming
methodical	gigantic	simple
practical	ceremonious	fine
provisional	impressive	smart
rational	imposing	artless
accidental	colossal	vain
sensible	majestic	distinguished
well-arranged	minimal	considerate
well-placed	memorable	proud
space-saving	monumental	luxurious
perspicuous	mighty	modest
purposeful	humble	fashionable
without purpose	unimportant	unpretentious
superfluous	grand	full of piety
lucid	splendid	pretentious
thought-out	magnificent	gaudy
considered	respectable	boastful
	commanding respect	snobbish
	stately	bumptious
44	trivial	artful
cheap	worthy	unwieldy
depreciated	awe-inspiring	over-refined
dear	pitiful	over-idealized
expensive	venerable	upper-class
poor	deplorable	
wealthy	overwhelming	
insolvent		48
		respected

praised	well-built	natural
disreputable	well-made	contrary to nature
famous	fragile	unnatural
celebrated		unfaked
eminent		undisguised
outstanding	51	undistorted
scoffed at	idyllic	ingenuous
eulogized	earthly	affected
notable	unnoetical	primordial
renowned	unromantic	
famed	picturesque	
fishy	poetic	54
suspect	prosaic	in a classical style
dubious	romantic	imitated
rejected	replete with feeling	false
well-known		artificial
familiar		genuine
notorious	52	humbug
	academic	hypocritical
	aristocratic	inimitable
49	bohemian	unfaked
economic	countryish	dishonest
uneconomic	middle-class	real
unprofitable	exotic	true
wasteful	expressionistic	
thrifty	classic	
	rural	55
	oriental	architectonic
50	patrician	decorative
durable	primitive	aesthetic
destructible	foreign	pure in form
solid		beautifully formed
keeps well		irregular in form
firm	53	becoming
hardy	artificial	artistic
indestructible	unaffected	misshapen
non-lasting	faked	disfiguring
rustic	botched	unaesthetic
stable	distorted	unbecoming
permanent	fancied	tasteful

tasteless	well-poised	artless
true to style	well-balanced	artful
stylish		promising
of pure style		successful
attractive	57	inferior
well-shaped	definite	moderate
	diffuse	masterful
	exact	lacking in nuances
56	shapeless	rich in nuances
balanced	concise	worthless
different	lacking contours	inimitable
dimensioned	purposeful	unskilful
disparate	indefinite	perfect
unitary	muddled	resourceful
harmonious	precise	scandalous
whole	disconnected	sharp
homogenous		competent
incongruous		brilliant
irregular	58	sterile
congruous	made ugly	talented
contrary	embellished	talentless
lawful	not beautified	lower-class
full of contradictions		wretched
much disputed		rotten
unbalanced	59	extraordinary
non-uniform	deplorable	infamous
disharmonious	defect	pitiful
controversial	foolish	superb
disproportionate	miserable	surpassable
anomalous	imaginative	
not in accordance	unimaginative	
assymmetrical	full of imagination	60
disagreeing	cunning	general
paradoxical	despicable	deviating
proportionate	degrading	exceptional
regular	genial	extreme
against rules	mediocre	formal
co-ordinated	full of ideas	average
concordant	lacking ideas	conventional
dispersed	incompetent	curious

normal
original
customary
routine
special
strange
peculiar
traditional
unique
universal
ordinary
common-place

61

understandable
bizarre
deceiving
curious
esoteric
conceivable
puzzling
intelligible
confusing
amazing
enigmatic
astonishing
illusory
confounding
quaint
comprehensible
easily understood
magic
mystifying
mysterious
strange
peculiar
incomprehensible
inexplicable
inapprehensible

remarkable
obvious
ghost-like
queer
surprising

62

formal
improvising
impulsive
informal
intuitive
consistent
correct
naïve
irremissible
restrictive
rigorous
spontaneous
strict
stringent

63

expressive
colourless
rich in colour
colourful
vapid
harmless
sissy-like
soulless
suggestive
expressive
expressionless
impressive
ineffective

64

conservative
radical
reactionary
revolutionary

65

archaic
fashionable
ancient
antiquated
old
old-fashioned
modern
contemporary
new
new fangled
unfashionable
timeless
up-to-date
as old as the hills
aged

66

dramatic
effectful
eventful
undramatic
exciting
ineffective

67

familiar
well-known
unfamiliar

68	72	77
urgent	drab	broad
unimportant	monotonous	deep
interesting	flexible	shallow
uninteresting	changeable	high
insignificant	unchanging	short
meaningless	varied	low
important	alternating	long
meaningful	stereotype	thin
superfluous	variable	
	varying	
	changing	78
69		oblong
amateurish		rounded
factory-like	73	steep
construction-like	looked at	bulging
engineering-like	seen	circular
technical	hidden	cylindrical
tectonic	unseen	elliptical
	invisible	flat
	visible	plane
70		angular
good		winding
bad	74	hilly
moderate	possible to improve	undulated
negative	incorrigible	curving
positive	plastic	square
	capable of development	linear
		rectilinear
71		straight
simplified	75	rectangular
complicated	made ready	round
complex	incomplete	skewed
difficult		pointed
multi-shaped		arched
uncomplicated	76	
unambiguous	unrestored	
composite	renovated	79
stylized		abstract
		idealistic

unreal	empire style
concrete	gothic
materialistic	renaissance
unrealistic	rococo
illusory	
salient	
realistic	82
symbolic	wet
theoretical	dampfree
utopian	damp
divorced from reality	dried up
true to life	dry
	desiccated

80

beige	83
blue	distant
brown	near

chocolate brown

vermillion

purple

grey

green

yellow

glittering like gold

golden

cream-coloured

orange

pink

red

black

violet

white

81

peasant-style

antique

brute style

baroque

Orders of presentation for interiors in main experiment 1.
(Compare illustration no. 1.)

1	2	3
D	L	H
C	O	J
A	N	I
B	M	F
E	K	G
H	D	L
G	B	O
I	A	K
F	E	M
J	C	N
O	G	E
N	J	C
K	I	D
M	H	B
L	F	A

How DISMAL do you believe the interior to be?

☐ ☐

least dismal

most dismal

least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐
least	☐	☐	☐	☐	☐	☐	☐	most	☐

The distribution of the experimental subjects on different orders of presentation in main experiment 1.

(The 78 variables were distributed in such a way that, during the first third of the experiment each variable was estimated by approximately 14 persons, during the middle part of the experiment by approximately 14 persons and during the last part of the experiment by approximately 14 persons. Within each position the variables were distributed at random.)

Order of presentation for interiors

		1	2	3
Order of presentation for variables	1	man age 19	man age 17	man age 19
		man age 17	man age 17	man age 17
		woman age 17	woman age 17	woman age 17
		woman age 17	woman age 17	woman age 17
			woman age 17	woman age 17
	2	man age 17	man age 18	man age 18
		man age 17	man age 17	man age 17
		woman age 18	man age 16	woman age 18
		woman age 18	woman age 18	woman age 17
		woman age 17		
	3	man age 17	man age 17	man age 19
		man age 17	man age 17	man age 16
		man age 17	woman age 18	woman age 18
		woman age 17	woman age 17	woman age 17
		woman age 17	woman age 17	

manner of approach in main experiment 1.

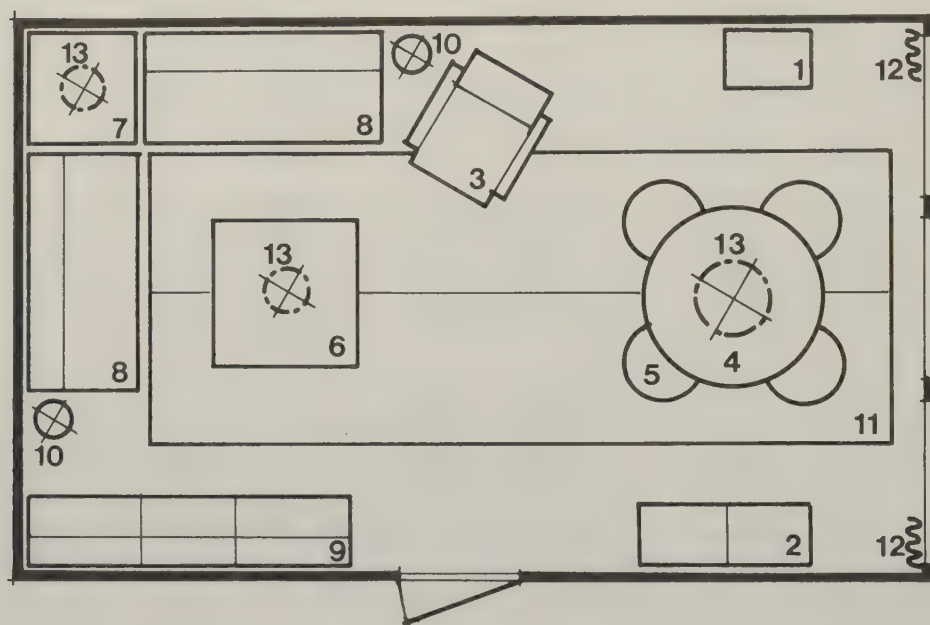
The experiments took place in the afternoon and lasted for each group about four hours. Two evenly distributed breaks were made when the experimental subjects were given coffee and buns. The judgements were carried out in a modern, sloping lecture hall of a roughly square shape. Projector Leitz Pradovit n 24 automat with optics Hektor 1:2, 5/120 mm and lamp 24 V, 150 W was placed behind and above the experimental subjects and against a white wall at a distance of 7 meters it gave a picture the size of 200 x 130 cm. The lighting in the room was sufficient for the forms to be read with ease. The experimental subjects were asked about vision and colour weaknesses. No problems of vision were reported. One subject was taken away in the processing as a result of colour weakness.

The aim of the test was informed of in general terms, whereafter the procedure was explained. The form was gone through, and here we stressed the subjective nature of the ratings. The experimental subjects were informed of a simple way of correcting tick-mistakes. They were instructed to interpret the different variables themselves, to carry out all ticks and to attract the attention of the test leader when making mistakes.

After a demonstration of a trial variable (POTENT) the test was completed. The 15 interiors were exposed with intervals of 8 seconds of which 6.5 seconds constituted exposure time and 1.5 seconds changing time. Ratings were carried out while the slide was being exposed. A stop-watch was used. At each change of slide, the experiment leader read out the number of the slide (1 - 15). After having judged all 15 interiors in the first variable, the subjects turned a leaf in the form and read the next variable, after which the procedure was repeated with the slides constantly in the same order. When a tick-mistake was made, a short pause was made for correction. All experiment leaders experienced the subjects as highly motivated, and this was also shown by their own statements. They experienced the judgements as meaningful and sometimes amusing. A common commentary after the tests was that the interiors they liked were given "high ratings".

Sketch of the room, scale 1:50, and description of the interior.

The experiment room was erected in a basement well lit with fluorescent tubes. The walls of the basement were white, as was the ceiling, and the floor was grey. The experiment room filled almost half the floor. The outside consisted of raw wood and wood-fibre. It was lit by one window. This was equipped with inclining reflectors painted in an aluminium colour. The source of lighting consisted of two spotlights Radiant TMCC 1 000 W, 120 V, R 60 HI - FLOOD 2M. These could be over-voltaged via a transformer, whereby the colour temperature of the light was changed. In the experiment, the voltage on each spotlight was 180 volt. The window was equipped with white venetian blinds inclined at an upward outward angle of 45° so as to obstruct the vision outward, but let the light in freely. This lighting was experienced by all four experiment leaders to be of a typical daylight quality.

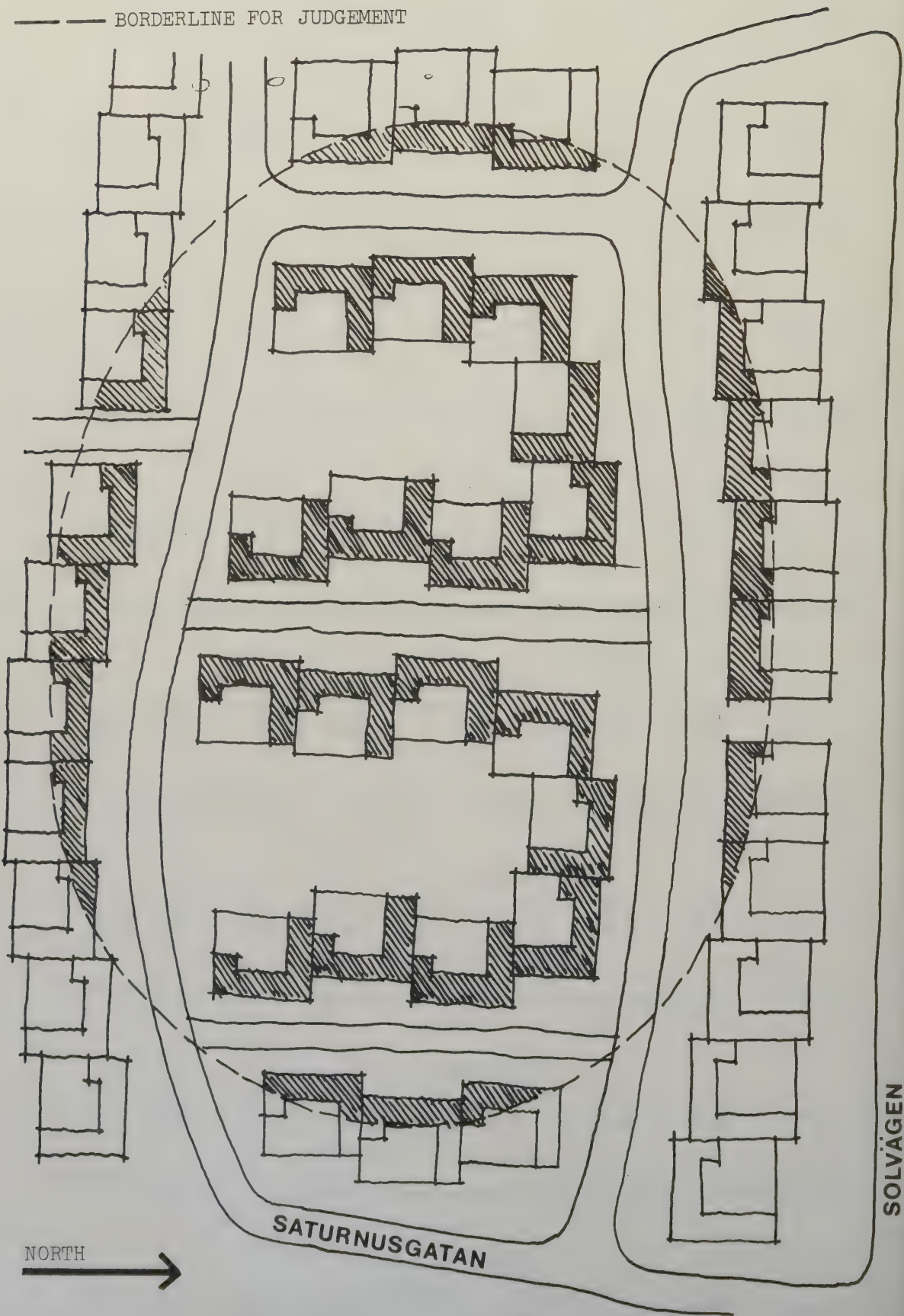


- 1 Bench, oak
- 2 Bench, oak with green cushion
- 3 Arm-chair painted white, black and white checked material in seat and
- 4 Dining-table, oak
- 5 Chair, beech, seat as well
- 6 Coffee-table, oak
- 7 Corner-table, oak with black linoleum top
- 8 Sofa, oak, bluish-green material in the seat and cushions
- 9 Book-cases, oak, with the lower part consisting of cupboards
- 10 Floor-lamp
- 11 Carpet, sisal, grey
- 12 Curtain, white
- 13 Ceiling lamp

Experimental subjects which evaluated the interior in full scale.

Age	Male	Female
14	1	2
15	9	4
16	9	1
17	12	4
18	8	5
19	1	1
20	3	-
21	-	-
22	2	-
23	-	-
24	1	-
Total	16	17

Plan over the housing development, scale 1:1000.



Orders of presentation for general environment in main experiment 2.
(Compare illustration no. 3.)

1	2	3
A	M	I
B	L	G
C	N	F
D	K	H
E	O	J
F	C	N
G	B	L
H	D	K
I	A	M
J	E	O
K	H	D
L	G	B
M	I	A
N	F	C
O	J	E

The distribution of the experimental subjects on different orders of presentation in main experiment 2.

		Order of presentation for general environment					
		1		2		3	
Order of presentation for variables	1	man	age 74	man	age 57	man	age 27
		man	age 26	man	age 30	man	age 20
		man	age 26	man	age 26	man	age 20
		man	age 20	man	age 18	woman	age 27
		woman	age 51	woman	age 59	woman	age 23
		woman	age 44	woman	age 45		
	2			woman	age 24		
				woman	age 21		
		man	age 24	man	age 29	man	age 23
		man	age 22	man	age 21	man	age 21
		woman	age 53	man	age 16	woman	age 53
		woman	age 43	woman	age 29	woman	age 46
	3	woman	age 28	woman	age 22	woman	age 39
						woman	age 27
						woman	age 24
						woman	age 22
		man	age 51	man	age 50	man	age 39
		man	age 26	man	age 21	man	age 25
		woman	age 43	woman	age 56	man	age 19
		woman	age 42	woman	age 48	woman	age 63
		woman	age 30	woman	age 44	woman	age 40
		woman	age 20	woman	age 22	woman	age 31

How STABLE do you believe the environment to be?

[illegible]

Variance analyses for section 3:2. The frame of reference of semantic judgement, experiment 1.

Variance analysis for PLEASANT/INVITING. General group.

Source of variation	df	F	P <
treatment (stations)	8	-	-
error	271		
total	279		

Variance analysis for PLEASANT/INVITING. Art-school group.

Source of variation	df	F	P <
A (subjects)	16		
B (stations)	8	5.83	.0005
AB	128		
Total	152		

Variance analysis for MOTLEY/UNTIDY. General group.

Source of variation	df	F	P <
treatment (stations)	8	1.60	.25
error	271		
total	279		

Variance analysis for MOTLEY/UNTIDY. Art-school group.

Source of variation	df	F	P <
A (subjects)	16		
B (stations)	8	6.83	.0005
AB	128		
Total	152		

Variance analysis for LIGHT/OPEN. General group.

Source of variation	df	F	P <
treatment (stations)	8	9.16	.0005
error	271		
total	279		

Variance analysis for LIGHT/OPEN. Art-school group.

Source of variation	df	F	P <
A (subjects)	16		
B (stations)	8	32.02	.0005
AB	128		
Total	152		

Variance analysis for WHOLE/UNITARY. General group.

Source of variation	df	F	P <
treatment (stations)	8	2.57	$\approx .01$
error	271		
total	279		

Variance analysis for WHOLE/UNITARY. Art-school group.

Source of variation	df	F	P <
A (subjects)	16		
B (stations)	8	3.74	.001
AB	128		
Total	152		

Variance analysis for PRACTICAL/FUNCTIONAL. General group.

Source of variation	df	F	P <
treatment (stations)	8	3.48	.001
error	271		
total	279		

Variance analysis for PRACTICAL/FUNCTIONAL. Art-school group.

Source of variation	df	F	P <
A (subjects)	16		
B (stations)	8	7.97	.0005
AB	128		
Total	152		

Variance analyses for section 3:2. The frame of reference of semantic judgement, experiment 2.

Variance analysis for pleasantness of two rooms in two orders of presentation.

Source of variation	df	F	P <
<u>Between subjects</u>	<u>49</u>		
A (order of presentation)	1	-	-
Subjects within groups	48		
<u>Within subjects</u>	<u>50</u>		
B (rooms)	1	48.78	.0005
AB	1	2.36	-
B x subjects within groups	48		

Variance analysis for complexity of two rooms in two orders of presentation.

Source of variation	df	F	P
<u>Between subjects</u>	<u>49</u>		
A (order of presentation)	1	-	-
Subjects within groups	48		
<u>Within subjects</u>	<u>50</u>		
B (rooms)	1	48.52	.0005
AB	1	-	-
B x subjects within groups	48		

Variance analyses for section 3:5. Semantic environment ratings and personality.

Analysis 1

Self rated extroversion. Individuals divided into extroverted and introverted according to EPI. Interiors divided into high and low complexity according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	-	
Subjects within groups	28	-	
B (environment)	1	-	
AB	1	-	
B x subjects within groups	28	-	

Analysis 2

Self rated extroversion. Individuals divided into neurotic and stable according to EPI. Interiors divided into high and low complexity according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	-	
Subjects within groups	28	-	
B (environment)	1	-	
AB	1	5.46	.05
B x subjects within groups	28	-	

Analysis 3

Self rated extroversion. Individuals divided into extroverted and introverted according to EPI. Interiors divided into high and low pleasantness according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	-	
Subjects within groups	28	-	
B (environment)	1	67.37	.0005
AB	1	-	
B x subjects within groups	28		

Analysis 4

Self rated extroversion. Individuals divided into neurotic and stable according to EPI. Interiors divided into high and low pleasantness according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	-	
Subjects within groups	28	-	
B (environment)	1	69.36	.0005
AB	1	-	
B x subjects within groups	28	-	

Analysis 5

Self rated neuroticism. Individuals divided into extroverted and introverted according to EPI. Interiors divided into high and low complexity according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	-	
Subjects within groups	28	-	
B (environment)	1	26.30	.0005
AB	1	-	
B x subjects within groups	28		

Analysis 6

Self rated neuroticism. Individuals divided into neurotic and stable according to EPI. Interiors divided into high and low complexity according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	4.95	.05
Subjects within groups	28	-	
B (environment)	1	34.93	.0005
AB	1	9.22	$\approx$.005
B x subjects within groups	28		

Analysis 7

Self rated neuroticism. Individuals divided into extroverted and introverted according to EPI. Interiors divided into high and low pleasantness according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	-	
Subjects within groups	28	-	
B (environment)	1	25.83	.0005
AB	1	-	
B x subjects within groups	28		

Analysis 8

Self rated neuroticism. Individuals divided into neurotic and stable according to EPI. Interiors divided into high and low pleasantness according to main experiment 1.

Source of variation	df	F	P <
A (personality)	1	4.33	.05
Subjects within groups	28	-	
B (environment)	1	26.28	.0005
AB	1		
B x subjects within groups	28		

Translated version of test for judging environment.^x

INSTRUCTION

An environment can be judged in a number of ways. One can, for example, experience it as more or less large, more or less beautiful or more or less unitary.

This booklet contains a number of rating scales where you are to tick off the way in which you experience the environment in which you are, from various aspects.

Here you will find an example of a rating scale

LARGE

slightly ☐ ☐ ☐ ☐ ☐ ☐ ☐ very

Immediately above the scale you will find the quality of the room intended in the scale. (LARGE) Tick one square only. The scale has seven steps. The square to the far left implies slightly and the square to the far right implies very LARGE etc.

All ratings are to be carried out while you are in the environment.

First of all you write your name at the bottom of this page. Then you turn the page and begin.

NAME:

DATE OF TEST:

DATE OF BIRTH:

ENVIRONMENT:

^x) The test will be published separately (Acking, Küller)

[illegible]

UGLY

slightly □ □ □ □ □ □ very

[illegible][illegible]

MASCULINE

slightly □ □ □ □ □ □ □ very

STIMULATING

slightly □ □ □ □ □ □ very

CLOSED

slightly □ □ □ □ □ □ very

slightly ☐ ☐ ☒ ☐ ☐ ☐ ☐ very

WELL-KEPT

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

ORDINARY

slightly ☐ ☐ ☒ ☐ ☐ ☐ ☐ very

SECURE

slightly □ □ □ □ □ □ very

OF PURE STYLE

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ ☐ very

BORING

slightly ☐ ☐ ☐ ☒ ☐ ☐ ☐ very

FRAGILE

slightly □ □ □ □ □ □ very

SUBDUE

slightly ☐ ☐ ☐ ☒ ☐ ☐ ☐ very

slightly □ □ □ □ □ very

OPEN

slightly □ □ □ □ □ □ very

IDYLLIC

[illegible]

SURPRISING

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

SIMPLE

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

AGED

slightly ☐ ☐ ☒ ☐ ☐ ☐ ☐ very

CONSISTENT

slightly ☐ ☐ ☐ ☒ ☐ ☐ ☐ very

LIVELY

slightly □ □ □ □ □ □ very

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

DEMARCATED

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ ☐ very

POTENT

slightly ☐ ☐ ☒ ☐ ☐ ☐ ☐ very

NEW

[illegible]

LAVISH

slightly □ □ □ □ □ □ very

COMPOSITE

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

PLEASANT

slightly □ □ □ □ □ □ very

FEMININE

☐ slightly ☒ ☐ ☐ ☐ ☐ ☐ very

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

BRUTAL

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

SPECIAL

slightly ☐ ☐ ☐ ☐ ☒ ☐ ☐ very

AIRY

[illegible]

Calculation form for the test^x

Instruction: The raw score (1-7) for each individual is first of all written in the margin of the test and thereafter transferred to the calculation form. The variables are here listed in the same order as in the test. They are divided according to factors in eight columns. The raw scores are written in the squares marked. The values for the negative variables are first transformed through the following procedure. $a' = (8 - a)$, where a' is the turned score and a is the raw score. The variables which are to be turned are marked (8 -). The factor values are obtained by means of adding each column and then dividing by 8 for the pleasantness and 4 for the remaining factors. This is indicated at the bottom of the form.

x) The test will be published separately (Acking, Küller)

NAME:
AGE:

DATE:
ENVIRONMENT:

	Plea- santness	Complex- ity	Unity	Enclo- sedness	Potency	Social status	Affec- tion	Origini- tality
MODERN							8-	☐
MOTLEY		☐						
UGLY	8-	☐						
CURIOUS								☐
EXPENSIVE						☐	☐	
MASCULINE					☐			
STIMULATING		☐						
CLOSED				☐				
FUNCTIONAL			☐					
WELL-KEPT						☐		
ORDINARY								8- ☐
SECURE		☐						
OF PURE STYLE			☐					
BORING	8-	☐						
FRAGILE					8-	☐		
SUBDUED		8-	☐					
TIMELESS								☐
OPEN				8-	☐			
IDYLIC		☐						
SURPRISING								☐
SIMPLE						8-	☐	
AGED								☐
CONSISTENT			☐					
LIVELY		☐						
GOOD		☐						
DEMARCATED				☐				
POTENT					☐			
NEW							8-	☐
LAVISH							☐	
COMPOSITE		☐						
PLEASANT		☐						
FEMININE					8-	☐		
WHOLE			☐					
BRUTAL	8-	☐						
SPECIAL								☐
AIRY				8-	☐			
TOTAL	:8	:4	:4	:4	:4	:4	:4	:4
MEAN VALUES								

The distribution of experimental subjects on sex and age when trying out the reliability of the test ($N = 30$) and the independence of the factors ($N = 46$).

Age	N = 30		N = 46	
	Male	Female	Male	Female
19	3	1	3	2
20	7	3	10	4
21	3	3	6	5
22	3	-	5	2
23	1	1	2	2
24	-	-	-	-
25	2	-	2	-
-				
-				
32	1	-	1	-
33	-	-	-	-
34	1	-	1	-
-				
-				
47	1	-	1	-
Total	22	8	31	15

English-Swedish translation of experimental variables and factor-names. By using this list the Swedish-speaking reader can make clear to himself what Swedish words were actually used in the experiments.

Variables

Abstruse	Svårfattlig	Comfortable	Bekväm
Aged	Ålderdomlig	Compact	Kompakt
Aggressive	Aggressiv	Complex	Komplex
Agile	Rörlig	Complicated	Komplicerad
Agreeable	Behaglig	Composite	Sammansatt
Airy	Luftig	Comprehensible	Lättfattlig
Anxious	Ängslig	Compressed	Sammanträngd
Appropriate	Ändamålsenlig	Confused	Oöverskådlig
Architectonic	Arkitektonisk	Consistent	Konsekvent
Assuming	Anspråksfull	Consonant	Samstämd
Attractive	Tilltalande	Cool	Sval
Bad	Dålig	Cosy	Ombonad
Badly thought-out	Ogenomtänkt	Curious	Egendomlig
Beautiful	Vacker	Dark	Mörk
Big	Stor	Decayed	Förfallen
Blue	Blå	Demarcated	Avgränsad
Bohemian	Bohemisk	Depressing	Beklämmande
Boring	Tråkig	Desolate	Ödslig
Brutal	Brutal	Destroyed	Förstörd
Calm	Lugn	Disagreeable	Obehaglig
Calming	Lugnande	Discreet	Diskret
Cautious	Försiktig	Dismal	Kuslig
Cheap	Billig	Dispersed	Splitträd
Cheerful	Glad	Distinguished	Förnäm
Clear	Klar	Dynamic	Dynamisk
Close	Inpå	Easy	Lätt
Closed	Sluten	Effective	Effektiv
Cluttered	Hopgytttrad	Elegant	Sirlig
Cold	Kall	Empty	Tom

Encumbered	Överfylld	Lavish	Påkostad
Expensive	Dyrbar	Light	Ljus
Expressive	Uttrycksfull	Lively	Livlig
Extroverted	Utåtriktad	Low status	Låg status
Feminine	Feminin	Lucid	Överskådlig
Filled	Fylld	Manly	Manlig
Fine	Fin	Masculine	Maskulin
Formal	Stel	Meagre	Snål
Fragile	Ömtålig	Middle-class	Borgerlig
Fragrant	Välldoftande	Misanthropic	Människofientlig
Friendly	Vänlig	Modern	Modern
Functional	Funktionell	Modest	Anspråkslös
Functions badly	Fungerar dåligt	Monotonous	Enformig
Functions well	Fungerar bra	Motley	Brokig
Good	Bra	Narrow	Trång
Green	Grön	Natural	Naturlig
Hard	Hård	Negative	Negativ
Harmonious	Harmonisk	Nerve-racking	Nervpåfrestande
Healthy	Hälsosam	New	Ny
Heavy	Tung	Odd	Konstig
High status	Hög status	Of pure style	Stilren
Humble	Oansenlig	Open	Öppen
Humorous	Humoristisk	Ordinary	Vanlig
Idyllic	Idyllisk	Organized	Organiserad
Imaginative	Fantasifull	Original	Originell
Immediate	Omedelbar	Permanent	Varaktig
Impersonal	Opersonlig	Personal	Personlig
Impractical	Opraktisk	Picturesque	Pittoresk
Impressive	Imponerande	Pleasant	Trivsamt
Inappropriate	Oändamålsenlig	Poor	Fattig
Independent	Oberoende	Positive	Positiv
Ineffective	Ineffektiv	Potent	Kraftfull
Ingenuous	Okonstlad	Practical	Praktisk
Insignificant	Intetsägande	Pretentious	Pretentiös
Interesting	Intressant	Primordial	Ursprunglig
Introverted	Inåtvänd	Quick	Snabb
Inviting	Inbjudande	Quiet	Tyst

Rational	Rationell	Unpleasant	Otrivsam
Red	Röd	Unrational	Orationell
Replete with feeling	Stämningsfull	Unrestful	Orolig
Repulsive	Frånstötande	Untidy	Stökig
Rural	Lantlig	Unusual	Ovanlig
Rhythmical	Rytmask	Varied	Omväxlande
Scattered	Spridd	Warm	Varm
Secure	Trygg	Well-kept	Välvårdad
Serious	Allvarlig	Well-planned	Välplanerad
Silent	Tystlåten	Well-shaped	Välformad
Simple	Enkel	Well thought-out	Genomtänkt
Sociable	Kontaktskapande	Whole	Helhetsbetonad
Soft	Mjuk	Womanly	Kvinnlig
Solid	Gedigen	Yellow	Gul
Soothing	Rogivande		
Spacious	Rymlig		
Special	Speciell		
Splendid	Praktfull		
Stable	Stabil		
Sterile	Steril		
Stimulating	Stimulerande		
Subdued	Dämpad		
Sunny	Solig		
Surprising	Överraskande		
Talkative	Pratsam		
Tasteful	Smakfull		
Temporary	Tillfällig		
Timeless	Tidlös	<u>Factors</u>	
Ugly	Ful	Affection	Affektion
Unclear	Oklar	Complexity	Komplexitet
Uncomplicated	Okomplicerad	Enclosedness	Rumslighet
Unfamiliar	Främmande	Originality	Originalitet
Unfriendly	Ovänlig	Pleasantness	Trivsamhet
Uninteresting	Ointressant	Potency	Kraftfullhet
Unitary	Enhetlig	Social status	Social status
Unorganized	Oorganiserad	Unity	Helhet

Swedish standard version of test for judging environment.^x

INSTRUKTION

Det är möjligt att bedöma en miljö på ett stort antal sätt. Man kan exempelvis tycka att den är mer eller mindre stor, mer eller mindre vacker eller mer eller mindre enhetlig.

Detta häfte innehåller ett antal skattningsskalor, där Du skall markera hur Du upplever den miljö, Du befinner Dig i, i olika avseenden.

Här är ett exempel på en skattningsskala

STOR

litet ☐ ☐ ☐ ☐ ☐ ☐ ☐ mycket

Omedelbart ovanför skalan står vilken egenskap hos miljön skalan avser (STOR). Markering sker genom att sätta kryss i en ruta. Skalan har 7 steg. Rutan längst till vänster innebär litet och rutan längst till höger mycket av egenskapen.

Samtliga skattningar skall utföras medan Du befinner Dig i miljön.

Skriv först Ditt namn nederst på denna sida. Vänd därefter blad och börja.

NAMN

DATUM

FÖDELSENUMMER

BEDÖMD MILJÖ

x) Testet kommer att publiceras separat (Acking, Küller)

[illegible]

VÄLVÅRDAD

litet □ □ □ □ □ □ mycket

VANLIG

litet ☐ ☐ ☐ ☐ ☒ ☐ ☐ mycket

TRYGG

[illegible]

STILREN

litet ☐ ☐ ☐ ☒ ☐ ☐ ☐ mycket

TRÅKIG

litet ☐ ☐ ☒ ☐ ☐ ☐ ☐ mycket

ÖMTÅLIG

[illegible]

DÄMPAD

[illegible]

TIDLÖS

litet □ □ □ □ □ □ mycket

ÖPPEN

litet □ □ □ □ □ □ □ mycket

IDYLLISK

litet □ □ □ . □ □ □ mycket

ÖVERRASKANDE

litet ☐ ☐ ☒ ☐ ☐ ☐ ☐ mycket

ENKEL

litet □ □ □ □ □ □ □ mycket

ÅLDERDOMLIG

litet ☐ ☐ ☒ ☐ ☐ ☐ ☐ mycket

KONSEKVENT

litet □ □ □ □ □ □ □ mycket

LIVLIG

litet ☐ ☐ ☐ ☐ ☐ ☒ ☐ mycket

litet □ □ □ □ □ □ □ mycket

AVGRÄNSAD

litet ☐ ☐ ☐ ☒ ☐ ☐ ☐ mycket

KRAFTFULL

litet □ □ □ □ □ □ □ mycket

NY

litet □ □ □ □ □ □ □ mycket

PÅKOSTAD

litet ☐ ☐ ☐ ☐ ☒ ☐ ☐ mycket

SAMMANSATT

litet □ □ □ □ □ □ □ mycket

TRIVSAM

litet ☐ ☐ ☐ ☒ ☐ ☐ ☐ mycket

FEMININ

[illegible]

Calculation form for the Swedish standard version of the test^x

Utvärderingsblankett för testet

Anvisning: Varje individs råvärde (1-7) skrives först ut i testets marginal och överföres därefter till utvärderingsblanketten. På denna står variablerna i samma ordning som i testet. De är faktorsvis indelade i åtta kolumner. Råvärdena föres in i de markerade rutorna. Värdena för de negativa variablerna vändes först genom följande operation. $a' = (8 - a)$, där a' är det vända värdet och a är råvärdet. De variabler som skall vändas är markerade (8 -). Faktorvärdena erhålles genom att summera varje kolumn och därefter dividera med 8 för trivsamt och 4 för de övriga faktorerna. Detta finns angivet längst ned på blanketten.

x) Testet kommer att publiceras separat (Acking, Küller)

NAMN:

DATUM:

180

FÖDELSENUMMER:

BEDÖMD MILJÖ:

	Trivs	Kompl	Helh	Rumsl	Kraft	Social	Aff	Orig
MODERN							8-	☐
BROKIG		☐						
FUL	8-	☐						
EGENDOMLIG								☐
DYRBAR						☐		
MASKULIN					☐			
STIMULERANDE		☐						
SLUTEN				☐				
FUNKTIONELL			☐					
VÄLVÅRDAD						☐		
VANLIG								8-
TRYGG		☐						☐
STILREN			☐					
TRÅKIG	8-	☐						
ÖMTÅLIG					8-	☐		
DÄMPAD		8-	☐					
TIDLÖS							☐	
ÖPPEN				8-	☐			
IDYLLISK		☐						
ÖVERRASKANDE								☐
ENKEL						8-	☐	
ÅLDERDOMLIG							☐	
KONSEKVENT			☐					
LIVLIG		☐						
BRA		☐						
AVGRÄNSAD				☐				
KRAFTFULL					☐			
NY								
PÅKOSTAD							8-	☐
SAMMANSATT		☐				☐		
TRIVSAM		☐						
FEMININ					8-	☐		
HELHETSBETONAD			☐					
BRUTAL	8-	☐						
SPECIELL								
LUFTIG				8-	☐			☐
SUMMA	:8	:4	:4	:4	:4	:4	:4	:4
MEDELVÄRDEN								

ILLUSTRATIONS

1. The 15 interiors termed A to O.
2. The 15 landscapes termed A to O.
3. The 15 general environments termed A to O.
4. The 15 interiors ranked according to increasing pleasantness.
5. The 15 landscapes ranked according to increasing pleasantness.
6. The 15 general environments ranked according to increasing pleasantness.
7. The 15 interiors ranked according to increasing complexity.
8. The 15 landscapes ranked according to increasing complexity.
9. The 15 general environments ranked according to increasing complexity.
10. The 15 interiors ranked according to increasing unity.
11. The 15 landscapes ranked according to increasing unity.
12. The 15 general environments ranked according to increasing unity.
13. The 15 interiors ranked according to increasing enclosedness.
14. The 15 landscapes ranked according to increasing enclosedness.
15. The 15 general environments ranked according to increasing enclosedness.
16. The 15 interiors ranked according to increasing potency.
17. The 15 general environments ranked according to increasing potency.
18. The 15 interiors ranked according to increasing social status.
19. The 15 general environments ranked according to increasing social status.
20. The 15 interiors ranked according to increasing affection.
21. The 15 general environments ranked according to increasing affection.
22. The 15 interiors ranked according to increasing originality.
23. The 15 general environments ranked according to increasing originality.

ILL. 1. The 15 interiors termed A to O.

A



B



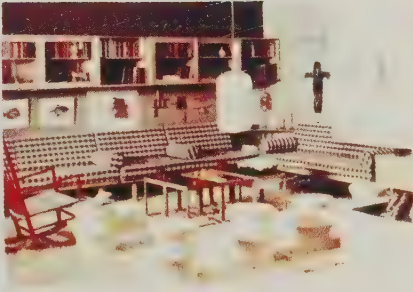
C



D



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H



I



J



K



L



M



N



O



ILL. 2. The 15 landscapes termed A to O.

A



B



C



D



E



F



G



H



I



J



K



L



M



N



O



ILL. 3. The 15 general environments termed A to O.

A



B



C



D



E



F



G



H



I



J



K



L



M



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O



ILL. 4. The 15 interiors ranked according to increasing pleasantness.

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ILL. 5. The 15 landscapes ranked according to increasing pleasantness.

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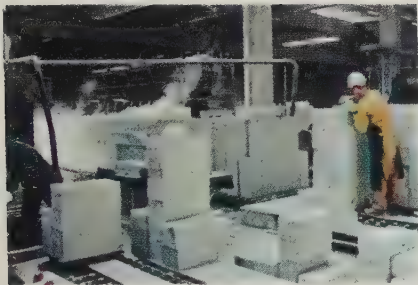


15



ILL. 6. The 15 general environments ranked according to increasing pleasantness.

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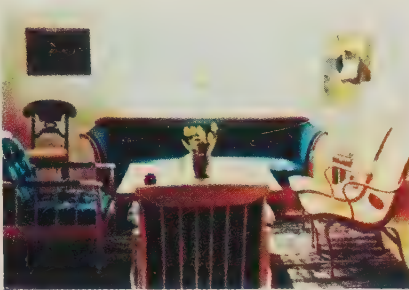


ILL. 7. The 15 interiors ranked according to increasing complexity.

1



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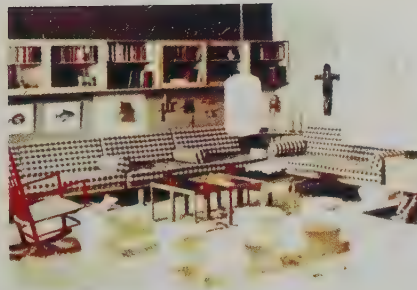
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ILL. 8. The 15 landscapes ranked according to increasing complexity.

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ILL. 9. The 15 general environments ranked according to increasing complexity.

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ILL.10. The 15 interiors ranked according to increasing unity.

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ILL.11. The 15 landscapes ranked according to increasing unity.

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ILL.12. The 15 general environments ranked according to increasing unity.

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ILL.13. The 15 interiors ranked according to increasing enclosedness.

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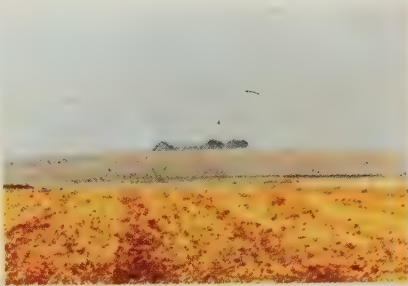


ILL.14. The 15 landscapes ranked according to increasing enclosedness.

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ILL.15. The 15 general environments ranked according to increasing enclosedness.

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ILL.16. The 15 interiors ranked according to increasing potency.

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ILL.17. The 15 general environments ranked according to increasing potency.

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ILL.18. The 15 interiors ranked according to increasing social status.

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ILL.19. The 15 general environments ranked according to increasing social status.

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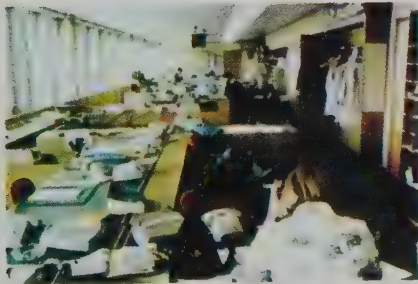
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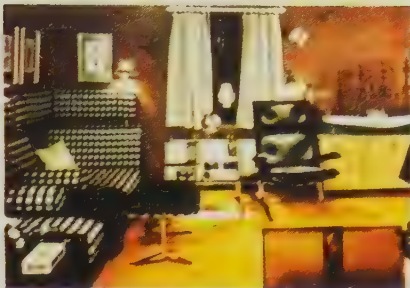


ILL.20. The 15 interiors ranked according to increasing affection.

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ILL.21. The 15 general environments ranked according to increasing affection.

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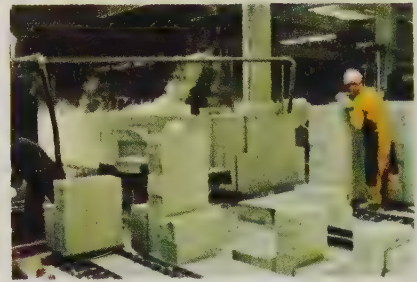
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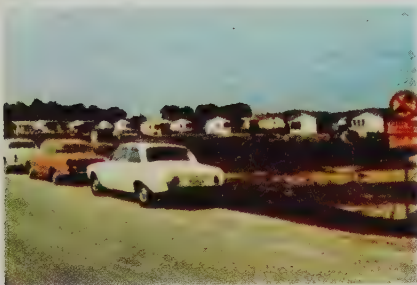
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ILL.22. The 15 interiors ranked according to increasing originality.

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ILL.23. The 15 general environments ranked according to increasing originality.

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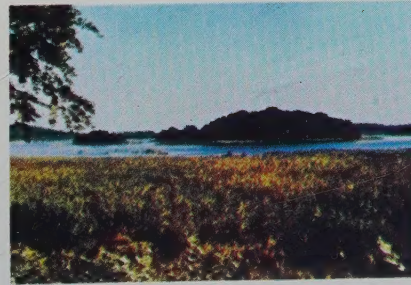
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D12:1972

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